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PENNSYLVANIA FOREST FIRE WARDEN MANUAL

By
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WITH SUGGESTIONS FROM
District Foresters and Others

Bulletin 36
Revised May, 1925

Pennsylvania Department of Forests and Waters
Robert Y. Stuart, Secretary
Harrisburg, 1924.

**FOREST DISTRICTS AND HEADQUARTERS
OF
DISTRICT FORESTERS**

Forest District Number	Name of Forest District	Post Office
1	Michaux	Fayetteville, R. D. No. 2
2	Buchanan	McConnellsburg
3	Tuscarora	Blain
4	Rothrock	Mt. Union
5	Logan	Petersburg
6	Penn	Milroy
7	Bald Eagle	Mifflinburg
8	Mont Alto	Mont Alto
9	Moshannon	Clearfield
10	Sproul	Renovo
11	Sinnemahoning	Driftwood
12	Tiadaghton	Williamsport
13	Elk	Emporium
14	Cornplanter	Warren
15	Susquehannock	Coudersport
16	Tioga	Wellsboro
17	Valley Forge	Harrisburg
18	Weiser	Pottsville
19	Delaware	Stroudsburg
20	Wyoming	Dushore
21	Lackawanna	Scranton
22	Forbes	Ligonier
23	Gallitzin	Johnstown
24	Kittanning	Clarion

INTRODUCTION

Until the people of Pennsylvania are more careful with fire in and near woodlands than they are with fire in their own homes, there will be forest fires. Until the forest owners in Pennsylvania care for their property and by reason of close utilization of the forest crop keep their woodlands free from unnecessary inflammable debris, forest fires will continue to be the beginnings of possible calamities. In the meantime the Commonwealth, the people organized for mutual protection, must maintain an organized force to prevent such calamities by preventing as far as possible the start and the spread of forest fires.

There is in existence now in Pennsylvania an organization of forest fire wardens with a Chief in Harrisburg, a District Warden in each of the twenty-four Forest Districts into which the State is divided and more than three thousand local forest fire wardens who live in or near the woodlands throughout the State. From these local wardens certain ones are chosen as inspectors who serve as assistants to the District Wardens during the forest fire seasons. Others are chosen to serve as towermen on the hundred or more towers manned each fire season and still others are chosen for other special duties.

But no matter how efficient the Chief or the District Wardens, Inspectors, Towermen, and special duty men may be, when a fire starts its extinction depends upon the local warden with his crew of fire fighters. It follows, therefore, that a manual which will enable them to become more proficient in the performance of their duties should be placed in the hands of the Wardens. The information presented in the following pages has been prepared with that object in view. However, this manual should also be of interest to forest land owners and others concerned with the protection of forests from fire and with the general welfare of their Commonwealth.

May 6, 1925

GEORGE H. WIRT.

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PENNSYLVANIA FOREST FIRE WARDEN MANUAL

Classes of Forest Fire Wardens

Referring to the law Sec. 501 it will be found that there are three classes of Forest Fire Wardens.

The first is the (1) LOCAL FOREST FIRE WARDEN who is appointed by the Chief Forest Fire Warden, because he is particularly interested in forest protection, and who is paid only for time spent in actually extinguishing fires or in the performance of other assigned duties. Employees of the State in the Department of Forests and Waters, the Board of Game Commissioners, the Board of Fish Commissioners and the Pennsylvania State Police, who are on salary, are (2) EX-OFFICIO FOREST FIRE WARDENS. They are not paid extra for fighting fires but their duties and powers are the same as those of the LOCAL FOREST FIRE WARDEN.

Certain persons may be designated as (3) SPECIAL FOREST FIRE WARDENS. They are not paid by the Commonwealth for fighting forest fires, due to the fact that their duties in their regular employment cover this work. Railroad section foremen who have been appointed as SPECIAL FOREST FIRE WARDENS come under this class.

Relation of Forest Fire Wardens to the Public

Forest Fire Wardens should remember that they are serving the public, which expects and is entitled to good service. Faithful performance of duty will reflect upon themselves and the Service. They should be courteous and prompt, exercising tact and good judgment. They should endeavor to make sure that every one understands the main points of the fire laws. They should strive to prevent violation of the fire laws, and give advice rather than warning. Since all human efforts are co-operative, the most useful Warden is one who understands the other fellow best.

Education

Each Warden should talk forest protection at every opportunity, cautioning or warning people who may be careless in the use of fire in the woods. He may induce merchants and others to have forest fire statements printed on checks, bill heads, letter heads, envelopes, calendars, and other printed matter. Above all things he must catch the spirit of fire prevention himself or he cannot transmit much enthusiasm to others.

The Department of Forests and Waters has different posters relative to the protection of the forests from fire. Each Fire Warden should have these distributed properly throughout his neighborhood. Permission should be obtained from landowners and those in charge of buildings before putting up posters. Care should be taken to use only small tacks in putting up posters as large nails injure trees and are difficult to remove and are of course too large to be readily used on card board. Frequently the Warden can get Boy Scouts, sportsmen, autoists, owners of woodland, and others, to distribute posters if he will supply them.

The amount of good that fire notices do depends very much upon the judgment used in placing them. They should be placed along roads, woods trails, fishing streams, at camp sites, and picnic grounds, and at other places where people collect or pass frequently. Along roads they should be placed on curves, bridges, cross roads, and where travel is slower than on straight stretches. Department posters may be placed along State Highways. Indoor notices should be placed in post offices, railroad stations, stores, town halls, shops, factories, garages, livery stables, blacksmith shops, offices, hotels, school houses, and wherever people congregate. Old posters torn or defaced should be replaced with new ones. Sportsmen's associations especially should be asked to assist in posting notices just before spring fishing season and fall hunting season. Wardens should send to the District Forester for as many posters as may be needed and upon their receipt all should be posted or distributed at the earliest opportunity. They do no good lying around. (For law on defacing signs see Sec. 1009.)

The Department issues small fire prevention circulars from time to time. A supply of these should be on hand constantly so that they can be distributed to individuals or groups of people at opportune times. Some Wardens make regular visits to the schools within their territory and distribute such circulars to the school children, explaining their work or having the teachers make such explanation.

Perhaps our most effective effort along educational lines is among children. It is easy to make a lasting impression on their minds and to convert them to an effective conservation movement. The school children, Boy Scouts and Girl Scouts are going to be the sportsmen, Forest Fire Wardens and law makers of the future.

In several cases Wardens have induced business firms to inclose a copy of one of the circulars to each of their patrons with the firm's correspondence. Circulars will be forwarded upon request, as will other kinds of available publicity material.

There will always be some people who are careless and indifferent. For such there must be some regulation and finally some punish-

ment. For this reason the cause of each fire should be investigated promptly and the person responsible should be prosecuted. It is only by persistently enlightening the public on the evils of forest fires and making the careless and indifferent pay the penalty for their acts that the forest fire problem can be adequately met. Brush burning and clearing of new ground in the spring is responsible for a great number of destructive fires. This is a problem that we must face. No brush burning should be done by anyone unless he fully understands that he may be the cause of a forest fire and that if a forest fire burns his neighbors' land he is liable for the damage.

Forest Fire Hazards

A forest fire hazard is any property which, by reason of its condition or operation may cause or aggravate forest fires.

The factors influencing forest fire hazards are inflammability, risk and liability.

Inflammability depends upon the ease with which material will ignite, and the amount of material on the ground.

Risk has been defined as "the likelihood of fires starting."

Liability is "the value of property subject to fire risk."

It should be remembered that sometime in the year practically every acre of woodland is a fire hazard. The material on the forest floor may be ignited easily, and it is likely to be set on fire in many ways. But, every acre of forest land cannot be declared a hazard under the law. An engine may throw out sparks, but if it operates only in and through farm lands, it cannot endanger forest land, and consequently it may not be declared a forest fire hazard. The conditions of both forest and engine must be such that a fire is likely to arise from the use of the engine.

The following may be considered as special forest fire hazards in accordance with the law until a ruling is obtained to the contrary. (See Sec. 1202 par. d):

1. Engines of all kinds not provided with effective spark arresters, ash pans, or other equipment to prevent the spread of fire, when such engines operate within 200 feet of woodland, or of other inflammable property likely to spread fire to woodland.
2. Inflammable debris within 100 feet of a steam railroad track. this includes uncleaned woodland which requires cleaning for the completion of a safety strip along the railroad.
3. Inflammable debris located within a radius of 150 feet from a saw mill or other engine operating within woodland, or operating within 150 feet of woodland.

4. Inflammable debris within 25 feet of the edge of the traveled part of a public highway, the clean road bed of an electric railway, or of any other frequented highway.
5. Slash from lumbering operations without a protective strip of 100 feet adjoining woodland.
6. Uncontrolled forest fire.

As used above, debris means such material as slash, mowings, or other wastage, and accumulated forest litter.

It should be understood in unusual or extraordinary cases the Department is not restricted to action based upon the conditions cited above. Its duty is to investigate independently or upon report, all fire hazards and to base its action upon the conditions in each particular case.

An uncontrolled forest fire is undoubtedly a public nuisance and must be abated promptly.

Where any of the foregoing constitute a serious menace, the matter should be courteously explained to the party responsible, and to the owner of the property which constitutes the hazard or upon which the hazard exists. If the hazard is not then removed, it should be reported at once to the District Forester, and if necessary the following form will be sent:

Form 77.

PENNSYLVANIA
DEPARTMENT OF FORESTS AND WATERS
BUREAU OF FOREST PROTECTION
HARRISBURG, PA.

ORDER FOR ABATEMENT OF SPECIAL FOREST FIRE HAZARD

Date.....

To.....

An inspection of the following described property (owned or operated) by you, namely:

.....

 was made by this Department on the.....day of....., 19.....
 the report of which inspection is now in this office and shows:

.....

 The condition or operation of this property constitutes during forest fire season a Special Forest Fire Hazard, endangering the property of others.

Therefore pursuant to my duty and authority under the Act of June 8, 1923, Section 1617 (j), and because of the Special Forest Fire danger, I declare your property to be a public nuisance and hereby notify and order you to abate the nuisance on or before the.....day of....., 19....., and advise you that such abatement may be done as follows:

.....

 A copy of the portions of the law in regard to Special Forest Fire Hazards and fixing penalty for non-abatement of such hazards, when declared a public nuisance by the Chief Forest Fire Warden, is printed on the reverse side of this order. Should you feel aggrieved by the foregoing order, you should apprise me of your reasons, and may, if you desire, appeal to the Secretary of Forests and Waters.

Yours truly,

.....
Chief Forest Fire Warden.

On the.....day of....., 19....., I served the above order upon.....by.....a true copy of the foregoing
 { with
 } to the person of.....

I accept service of the above order thisday of....., 19.....

Preparation for Forest Fire Seasons

Notwithstanding all the educational activities that may be put forth for some time to come, and all the preventive measures taken, the fact remains that "the fools are not all dead." We may still expect forest fires. **The wise thing to do is to prepare for them and for their prompt extinction.**

The way to prepare for forest fires is to have your crews organized, to have arrangements for transportation and food, to let everyone in your community know that you are a Fire Warden and ready to respond. If tools have been given to you they should be available and in good condition.

Organization

Each Forest Fire Warden must build up and maintain an effective forest fire organization in his community. It is poor policy to wait until there is a fire before organizing. In the first place, everyone in the community should know who the Forest Fire Warden is and how he may be reached. Each warden should have telephone connection in his own home, or should make arrangements for messenger service with the nearest neighbor having one, to deliver fire messages to him. He should see that his name is listed properly in telephone directories and elsewhere.

The poster giving the name and address of the local Warden should be posted extensively throughout his community, and should appear on or near his home. These things are necessary because of the importance of getting prompt notice of a fire's existence.

In every community there are those who for one reason or another are actively interested in the protection of forests from fire. It should be the aim of the Warden to locate such people, become acquainted with them, and secure their assistance in case of fire. Some of those who may be appealed to are: Land owners, officials and members of forest protective associations, railroad section foremen, Boy Scouts, Game and Fish Wardens, State Police, State Highway officials, County Farm Agents, and Rural Mail Carriers. The Warden should not expect to be notified by any of these agencies if they are not informed that he is a Warden and how he may be reached. Telephone linemen, pipe line walkers, railroad telegraphers, and other people who go back and forth through forested regions, can be induced to give prompt notice of fire. People living in advantageous positions are as good as paid watchmen if properly encouraged and their good will obtained.

Crews and Their Organization

The organization of forest fire fighting crews in the Warden's neighborhood is highly recommended. A captain or crew leader

should be named, to whom the crew may look for leadership in case of fire. These "Minute men" should be ready to respond immediately when called upon, and should know where to find their fire fighting tools at all times.

The crew should be able to act under a competent leader even if the Warden is not around. Every member should know that the tools must be strictly accounted for; also where transportation can be secured as well as food, if it is necessary.

To do effective work each member of the crew must know in advance what he is expected to do, and what tools he is expected to take, whether axe, rake, torch, fork, shovel, saw, pail, lantern. It is realized that it is not always possible to organize and keep together a crew of men, but a good warden will see to it that he has the support of reliable men in the community for service when the need arises. It will be well to prepare a list of such helpers in advance of the emergency. It must be understood that the Warden is foreman of all men in his crew and this means that to have a good crew he must be a good foreman.

Telephone Information

Your locality is in some Forest District and in this district there is a District Forester whom every Warden in the district should know how to reach by telephone, telegraph and mail. The District Forester makes the appointment of all of his employees and it is only through District Foresters that the State can effectively handle the administration of about 3,000 Forest Fire Wardens. In every Forest District there are one or more forest fire observation towers and during fire season the District Forester will provide for a watchman. When a fire occurs the towerman notifies the nearest Local Forest Fire Warden of the fire and also the district office, thus the alarm is spread. If a Fire Warden or any one else discovers a forest fire, in order to turn in the alarm, he should notify the nearest tower or the district office and also let them know what he is going to do to extinguish the fire.

Alarms

The sooner a fire is reported to a Warden the sooner he may begin his efforts to control and extinguish it. The more thoroughly he can induce the people of his community to notify him promptly the more efficient he will be. Therefore, he should develop some means of general forest fire alarm to call his crews together. This may be by whistle, bell or other means.

Knowledge of Country

Each Warden should have a map showing roads, streams, hills, woods, etc., in his township. He should know also, how to reach neighboring Wardens and should not hesitate to call upon them for assistance when necessary.

Fire Detection

A lookout for fire must be maintained whenever the woods are dry enough to burn. A Warden should not wait to be told of a fire when he sees it himself. If a Warden sees smoke or is notified of a fire, he should learn its exact location and notify the District Forester.

It sometimes happens that a Warden discovers or is notified of a fire in an adjoining district, or at a place which he cannot locate exactly. He should immediately attempt to locate the fire through telephone communication and find out if any one is looking after it. If he does not succeed in learning of it in this manner, other means may have to be used—he should find out at any rate.

In attempting to locate a forest fire, it is frequently a better plan to find out more about it by means of the telephone than to get a gang of men and an automobile and spend some hours trying to find it. Of course in some sections of the country, telephones are not available, but when you see smoke and you want to find out more about it, call the nearest tower. Every Warden should have posted beside his telephone the telephone calls for the District Forester, the nearest Wardens and the observation tower.

Whatever reasonable expense has been incurred in this way will be paid. If the fire is within reach, it is the Warden's duty to look after it. If it is nearer another Warden, that Warden must be notified immediately and information must be obtained as to whether he needs assistance. Should he be absent, people who are close to the fire ought to be instructed to go to it at once, and if the first Warden's presence is needed, he should go promptly. A Warden should not set up limits beyond which he will not go in case he is needed. When in doubt as to whether the fire is under control, there should be no hesitation in going and investigating to one's entire satisfaction.

It is much better to go out on a false alarm than to let a fire get well started.

As stated above, the more thoroughly the Warden interests the people of his community in fire detection, the more efficient he will be. Proper co-operation from local citizens will reduce the necessity for the erection of towers and employment of watchmen.

In connection with fire detection, Wardens should frequent those observation points which are high and afford a commanding view of the locality. The points from which particularly good views can be had should be reported to the Forester or District Fire Warden in order that he may have a record of them at times when he may be in position to construct towers or suggest their construction.

Observation towers should be manned whenever there is any danger of fire. Towermen should arrange to remain on the towers constantly from morning until night as instructed by the District Forester.

Fire Suppression

Whenever the Warden observes a fire or learns of it, it is his duty to look after it immediately. Prompt action in getting after the fire and in getting the crew out may be the means of preventing enormous destruction as well as stopping fire that would otherwise probably be very difficult to control. No two fires are alike, even though they may occur approximately in the same place. For this reason no hard and fast rules can be made as to how to control them yet it is good practice to figure out in advance just what could be done in case of a fire at any particular point and time in one's district. Strategy plays as big a part in fire fighting as in warfare.

The men should be taken to the fire in the shortest possible time in as fresh a condition as possible.

It must be remembered that we are employees of the State of Pennsylvania and that we should do our work as efficiently and as economically as we would do if it were for ourselves or a private firm. Fires are serious and the greatest precautions must be taken in seeing that they are utterly extinguished, but neither time nor auto expense should be used without good judgment as either of them soon makes unnecessarily high bills.

A number of years ago when fires occurred on mountains, people scratched paths about the fields on the upper side of the fences in order to save the fences and the fire was allowed to burn in the other direction. The Department of Forests and Waters is trying to save not only a few fences, but the forests. With these old methods in mind, much so-called fire fighting has developed into following a fire rather than fighting it. Following a fire even with a large number of men will never extinguish it. To extinguish it one must fight it.

Warden in Charge

The Warden is in charge at a fire and he must keep his crew in control at all times. Control of a crew is a fine test of skill and judgment. The different opinions of several men alternately expressed

and followed make the attack fitful and much time and labor may be lost. A line of action should be determined upon and then followed fast and hard. If more than 8 or 10 men are present, they may be divided and a foreman put over each crew. This will avoid idle time and will make possible the control of a fire more promptly. Each man should be set at doing the thing he can do best and the whole force used to best advantage.

Every Warden should have at his disposal and ready for instant use some conveyance to carry several men. If he owns no means of conveyance he should arrange with some one in the community for transportation. The judgment of the Warden should govern the number of men he deems necessary to control the fire.

In general it is better to have too many men than not enough, but there is a limit to this. Ten men are better than eight and fifteen are better than ten, but there is a limit to the number of men that one Warden can effectively direct. Forest fires have occurred at which one or two Wardens and 200 or 300 men have been present and as there were more men than the Wardens could direct, the result was that the whole number did not do as good work as 50 men could have done. Improper leadership is another great drawback in handling a large number of men. Even where a number of Wardens are present, wasted effort is due to lack of cooperation between Wardens. One Warden should be designated as being in charge of the fire and should direct the work of all the other Wardens so that the fire can be properly and effectively extinguished and not allowed to burn hour after hour due to scattered efforts.

Prompt Action

The efficiency of a Warden and his local organization is determined by the time which elapses between the start of the fire and the first attack. There should be no excuse for delay after a fire is known to exist. Quick action reduces expense, loss, hard work, and prevents big fires. Small fires are easily subdued. It is true that fire fighting is more effective in the evening, night, or early morning, but it is a criminal waste to wait until that time to begin.

Call of Crew

Ordinarily, it is not wise to call out more than two or three crews at the first call, unless the fire already has a good start, or that it is likely to become dangerous in a very short time. On the other hand, it is always well to remember that it is better to have one or two crews too many than to be one crew short. If, after reaching the fire it is found that more men will be needed, no time should be

lost in sending for additional forces. If necessary, nearby fire wardens should be notified by telephone or telegraph.

Organized Work

At a fire, the forest fire warden is in charge. He must keep the crew under his control at all times. Those who go to a fire should report to a warden. If the warden is absent, a foreman should be selected. The proper control of a crew requires skill and judgment. Too many bosses in a fire-fighting crew slow up the attack. Determine upon a method of attack, and follow it fast and hard. If more than eight or ten men are present, the force may be divided, with a foreman in charge of each crew. Each crew should be stationed at some important place on the fire line. In this way the fire may be more effectively controlled. By putting each man to the work he can do best, the whole force will be used to best advantage. For example, at a light surface fire one crew may be sent along the fire line with extinguishers or sprayers followed by men with rakes, shovels, hoes or brooms to clear the ground of litter and prevent the fire from crossing the line. Another crew may be sent for water to keep the spray tanks supplied. Or in case of a fire sweeping through brush and timber, if back-firing is resorted to, the foreman should go ahead and decide on the line from which the back-firing is to be done; one or two axemen should follow, then several men with forked sticks, rakes, brooms, hoes, shovels, mattocks, etc., should clear the trail down to bare earth. One torchman to set the back-fire is usually sufficient. He should be followed by guards, who are sometimes equipped with sprayers or chemical extinguishers, to prevent fire crossing the trail. The rear guard must be the most reliable man of the crew for he must see that the fire line is safe before he moves up the line.

Food for Fire Fighters

The men will often need food while working at a fire, if away from home 5 hours or more. The Warden should know where food can be obtained, and should make arrangements previously with his local merchants to supply the same to any messenger whom he might dispatch to get it. It will even be more satisfactory if the Warden and the store keeper make up a few lists of food and agree upon the number of men each list will supply. If it is necessary to go to private homes for supplies one must make the best of what he can get. Wardens must not forget that the Auditor General has ruled that the State cannot pay for "pop" and tobacco. He does not deem these to be necessities and they will not be paid for.

Assistance of Land Owners

The owner of the land or his representative and employees should be among the first to be called out for assistance in fire suppression.

Survey of Fire

Upon arrival at the fire, the Warden should find out as soon as possible what part of the fire is advancing most rapidly, and what timber or other property of most value is likely to be destroyed. He should hunt up the other wardens and learn the plan of attack. Keeping down the area burned over and the amount of damage are the two things for which he must work. He must decide quickly whether to place his men between the fire and the most valuable growth or in front of the most rapidly advancing flames. He should know the distance to the nearest trail, road, brook, or field. He should judge the speed of the fire and how far ahead he must start his attack, and remember not to allow his men to follow the fire but to **fight** it.

It is assumed the Warden will be prompt, and that he and his crew will arrive while the fire is small. But if for any reason a warden must attack a large fire he should take the men to the front; start the attack at a favorable place, and then size up conditions going entirely around the fire if necessary. No time must be lost, but a half-hour spent in making plans after a complete investigation, may determine the success or failure of the fight.

"For instance, to beat out a hot fire line in the woods within a short distance of a road in a dry time is generally mistaken judgment, since the fire is exceedingly likely to break over again as it would not with the bare soil of the road to help control it; or spreading a limited force of fighters on a long fire line, part of which is headed toward a natural barrier, and part of which is not, weakens the work where most needed and spends effort where unnecessary.

"Fire can be headed or directed into natural barriers like swamps, clearings, old burns, hedges, etc., by choosing which portion of the head fire to attack first, when the whole fire line cannot be met promptly and effectively because of its magnitude or of lack of help. Judgment used in this way is worth more than hours of labor". New Jersey Circular.

Methods of Fighting Forest Fire

The object of forest protection work is not only to prevent forest fires but also to detect and control those which occur before they grow large. Forest fire does damage not only to present growth but also prevents valuable growth from becoming established on

apparently worthless areas. Every forest fire does **some** damage. The efficiency of a Warden and his local organizations is determined by the time which elapses between the start of a fire and his first attack.

Quick action avoids expense, loss, hard work, and the probability of big fires. Small fires are easily subdued, and permit every one's getting back to his regular work in a short time. It is true that fire fighting is more effective in the evening, night, or early morning, but it is extremely bad policy to wait until that time to begin.

A local alarm bell or whistle and a prearranged place of meeting, help greatly. In case other assistance is needed, use the telephone as much as possible or send messengers to various homes. A small, well trained, well equipped crew at the beginning of a fire is worth 50 to 100 men later. One man should be started to the fire at once to make investigations and be ready to report to the Warden upon his arrival.

There are many methods of attacking a forest fire. Some are good and some are not. Some may think their method is the only one. A good warden is always ready to receive suggestions of value and is willing to give them fair trial at least. Methods of fighting vary with the character of the fire, character and condition of the forest, condition of atmosphere, strength and direction of wind, rapidity of fire's advance, topography, material on ground, etc.

TREE FIRES:

They are stopped by shutting off the air which makes a draft through the hollow trunk. Close the hole at the ground if possible with dirt. If this cannot be done, the ground around the burning tree should be cleared, and the tree should be felled. The fire can then be smothered inside and outside. If water is available, the fire may be put out with force pump or sprayer or chemical extinguisher without felling the tree. Dead snags in forests should be felled as a matter of fire prevention as well as for the benefit of the forest.

UNDERGROUND FIRES: These fires can be stopped only by digging deep enough to prevent their spread. The ditch, as well as the surface should be flooded if possible. This, however, is seldom possible. Where an underground fire has a good start it may be cheaper to blast a ditch than to dig one. Well-placed dynamite will do effective work in a short time.

CROWN FIRES: We have few crown fires in Pennsylvania. Natural conditions as to topography and growth are the best means of stopping any that may occur.



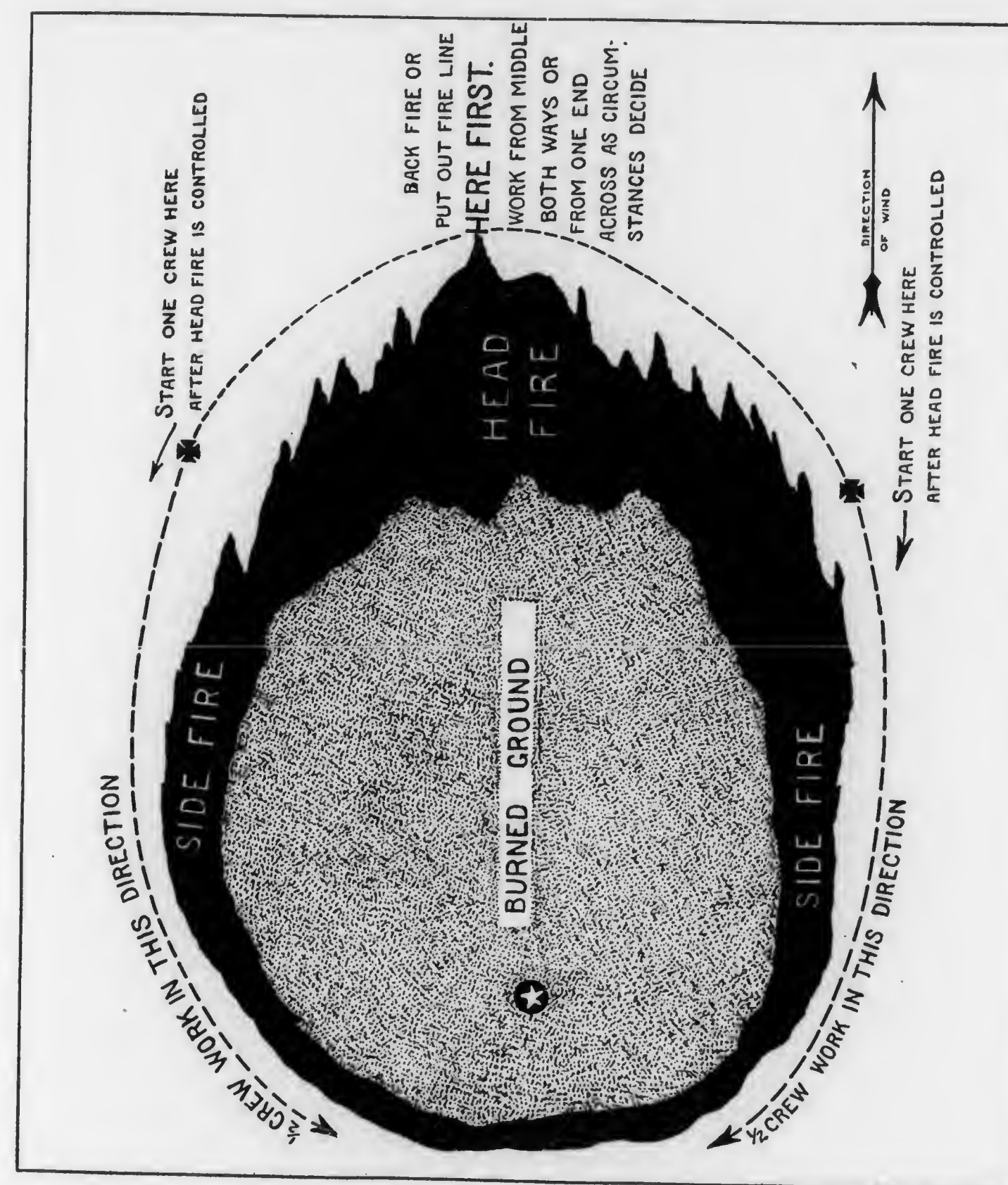
How a Forest Fire Burns When There is no Wind.

SURFACE FIRES: This is the kind of fires which occur most frequently in Pennsylvania. If there is little wind the flames may be put out by beating with branches (pine preferred), shovels, and wet burlap. Fire fighters should beat the flames with a side sweep toward the fire to avoid spreading sparks. Sweeping with old brooms, brooms made of branches, or steel brooms, is better than beating. The burning material may be pushed back upon the burned-over ground with rakes, sticks, forks, or other tools. The idea is to separate the burning material from that not yet afire. Water is always effective, but too frequently dependence is placed on it, and when it is not available fire fighters seem to be at a loss to know how to make their attack. The fire can be smothered by throwing on dry or moist sand or dirt. If it is possible to plow, a furrow may be thrown up quickly to restrict the spread of the fire.

Sometimes small or lightly-burning fires are beaten out. If no trail is cleared to the bare ground entirely around the burned area, here and there small pieces of smouldering wood may be fanned into flame and the fire may again break out. **It is always a safe practice to make a clean trail with exposed mineral earth entirely around the burned area.**

Chemical extinguishers are sometimes used. Careful tests have been made by foresters and it has been found that the chemical spray is of no more value in the woods than is plain water with a little force back of it. This force can be supplied by a foot pump, or by air pressure, as in the ordinary fruit spraying devices. Sprinkling water in front of the fire reduces the force of the flames and permits close beating and raking. To be effective, considerable water is required when it is sprinkled directly on the flames. Water is used to the best advantage when the stream is thrown at the ground im-

mediaely in front of the flames. The water and force combined will stop the flame's advance. It is also satisfactory to spray water against the base of the flames from the rear particularly if there is much smoke.

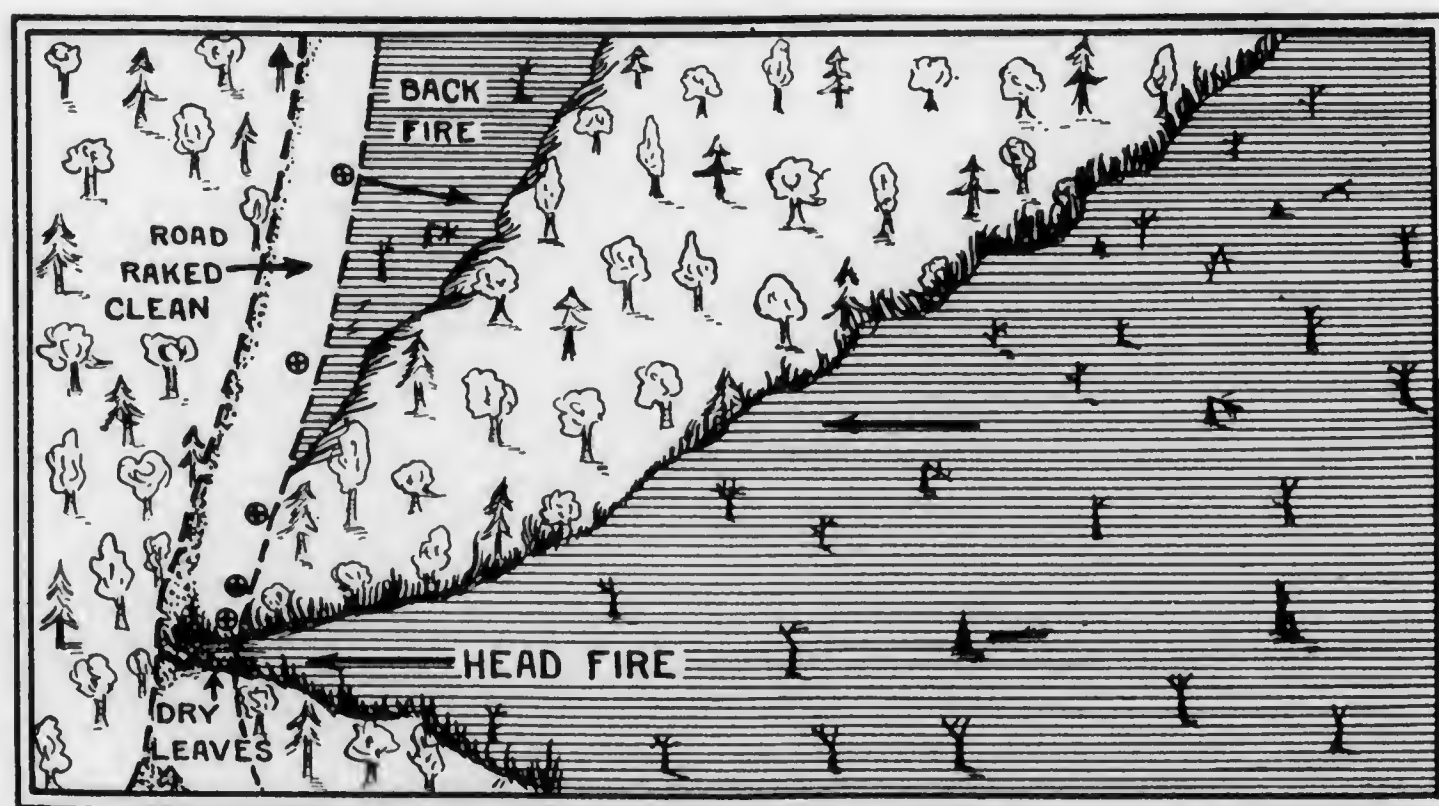


The Correct Way to Attack Any Forest Fire. Always Work From in Front Toward the Rear. Stop the Head-fire First and Work Far Enough to Each Side so That the Side-fire Cannot Work Around to a New Head-fire.

BACK-FIRING: When the wind is strong or when the flames are in slash, fallen logs, dead ferns, bracken, or grass, fire becomes so intense that it is unsafe and impracticable to attempt close attack. Back-firing is resorted to in such cases. It should be remembered

that fire is a dangerous force and that when fire is fought with fire extreme care and keen judgment must be used. If a fire starts some area will be burned-over and some growth will be damaged, but in order to reduce the damage as much as possible some additional sacrifice may have to be made by starting a back-fire. The area to be covered by the back-fire should, however, be kept as small as is practicable.

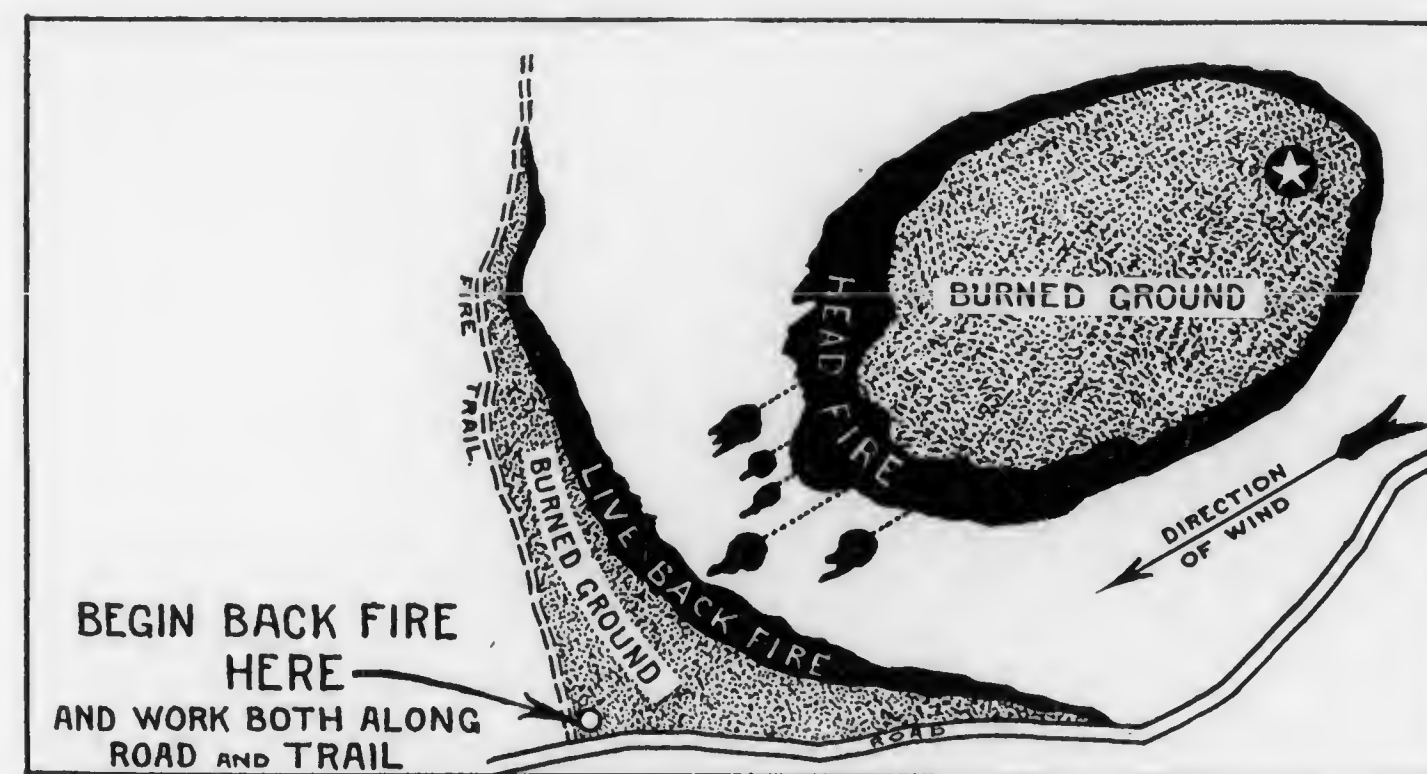
Frequently under excitement, the speed at which the original fire is traveling is misjudged and a back-fire is started too close to it or too far in advance of it, usually the latter. Occasionally a back-fire has been set at the foot of a mountain along a road to stop a fire just coming over the top. Sometimes a land owner has set a back-fire along his property line without regard to where it may go or where the original fire was. Indiscriminate back-firing cannot be condemned too strongly. A lack of information regarding the locations of fire breaks already established and the topography may result in errors in back-firing. (Everyone should be on the watch for such cases and report them.) Such errors should be reported to the person in charge of the fire-fighting crews. After the necessity for starting a back-fire has been determined—and not before—the back-fire should be started as close to the main fire as practicable. Sometimes back-fires do not stop the original blaze. In that case the crew must drop back to a second line of defense and renew the attack. The retreat should be made promptly and the new fight started at once from the most advantageous position.



The Incorrect Way to Attack by Back-fire. The Head-fire Reaches the Fire-break and Jumps Over it Before the Back-fire Reaches the Point of Advantage.

Fire burns slowly down hill, and rapidly up hill. Therefore a good place to start a back-fire is just over the brow of a hill up which a fire is advancing on the opposite side. Fires burn slowly against the wind and rapidly with the wind. The heat and draft from the advancing fire attracts the heat from the back-fire and hastens the advance of the latter when the two are approaching. Observation of the force and direction of the wind will give warning in time to protect the men. It will also indicate whether a quick advance should be made to another point that is threatened by the flames.

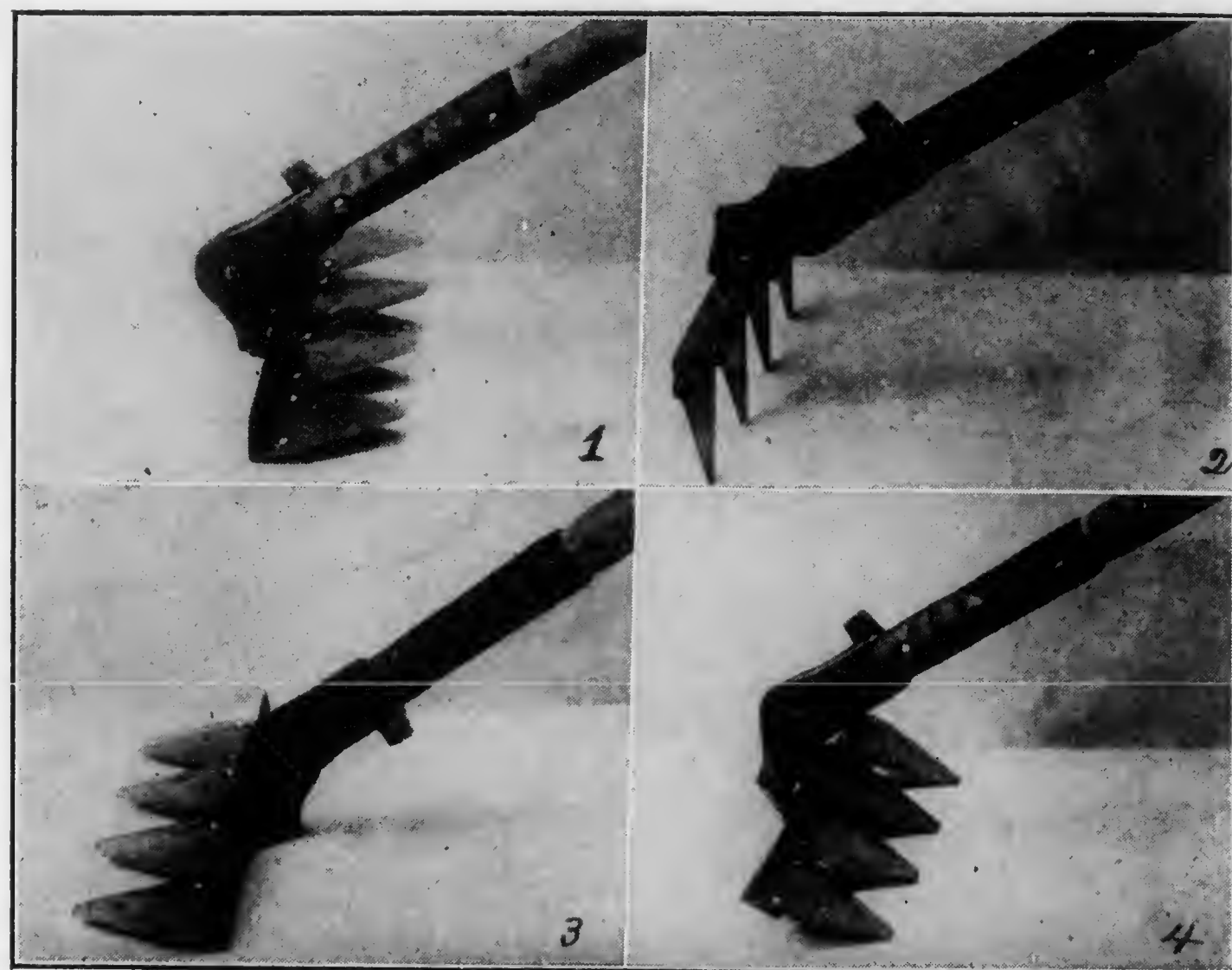
A back-fire should be started from a fire-break, such as a road, stream, or other natural barrier. In case a fire-break is not found at the proper place for back-firing, one must be made. The ground should be cleared so that the damp mineral soil is exposed. Such a trail can be made very quickly even through brush with forked sticks, if no other tools are available. Of course, axes, brush hooks, rakes, hoes, shovels, and brooms are better tools.



Where an Angle Can be Used a Back-fire May Have to be Longer, but the Area Burned by the Back-fire is Reduced. Be Careful that the Side-fire Does not Come up Before the Wings of the Back-fire are Safe.

Usually the smoke is thickest, fighting is most uncomfortable, and danger of spark-spreading is greatest in line with the draft of the fire. The back-fire should be started at this point, and every man available is needed there. The back-fire should be started at the lower point of a V, the sides of which are open enough and extended far enough to include the header of the advancing fire. The whole crew is available to attack promptly the spot fires in case of sparks cross the fire-break. As soon as the header is halted the side lines of the back-fire may be drawn in close to the side lines of the

main fire and continued parallel to them, or even run into them. The rest of the fire-line may be beaten out. Remember, however, that a trail cleared to mineral soil should extend entirely around each fire to make it safe. The crew, even if small, should be divided at the point of the V, with a few more men on the side which should be advanced more rapidly or on which the danger is greater because of the wind.



The Rich Fire-tool, Which can be Adjusted into Four Positions is a Most Effective Fire-fighting Instrument.

A satisfactory arrangement of crew is as follows: The warden or foreman directs the course and location of the fire-break, if one must be made. He is in charge of the whole fire-fighting force and should urge each man to do his best. According to the amount of brush to be cut one or two axemen or brushcutters follow the warden. Four men with small wooden rakes, or some other tool, one working close to the other, make a clean trail, exposing the mineral soil, raking the material to the side away from the fire unless it is needed to start a back-fire. Next comes a man with a torch. He must not set fire too rapidly for the nearest raker, nor the guards who follow him. If the torchman sets fire too rapidly for the rakers the heat may drive them off their course, and if too rapidly for the

guards, the fire may not burn away from the trail fast enough to permit their moving up with the torchman. As a result sparks may blow across the trail where there will be no one to discover and stamp them out immediately. Four alert and active guards can take care of a long line of back-fire. They should have three-gallon spray tanks and a continuous supply of water. They should have also a rake or broom. Pine brush may be used in the absence of a better tool. The rear guard must be the most dependable man in the crew for he must determine when the line is safe and must not leave it until it is safe. It is important that someone who knows the woods after dark should be detailed to carry water.

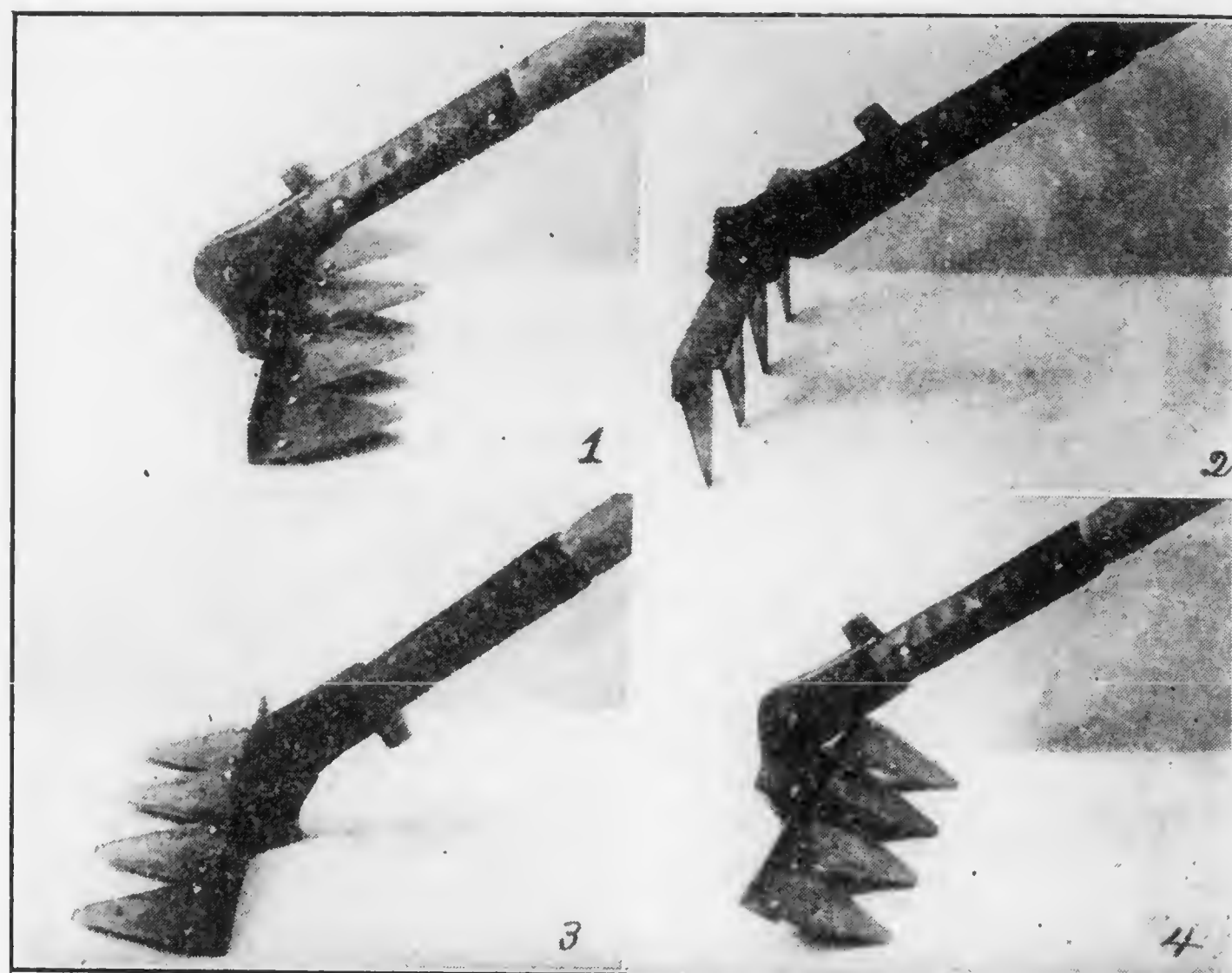


Back-fires Are Started With Torches.



A Wooden Rake Makes a Clean Trail.

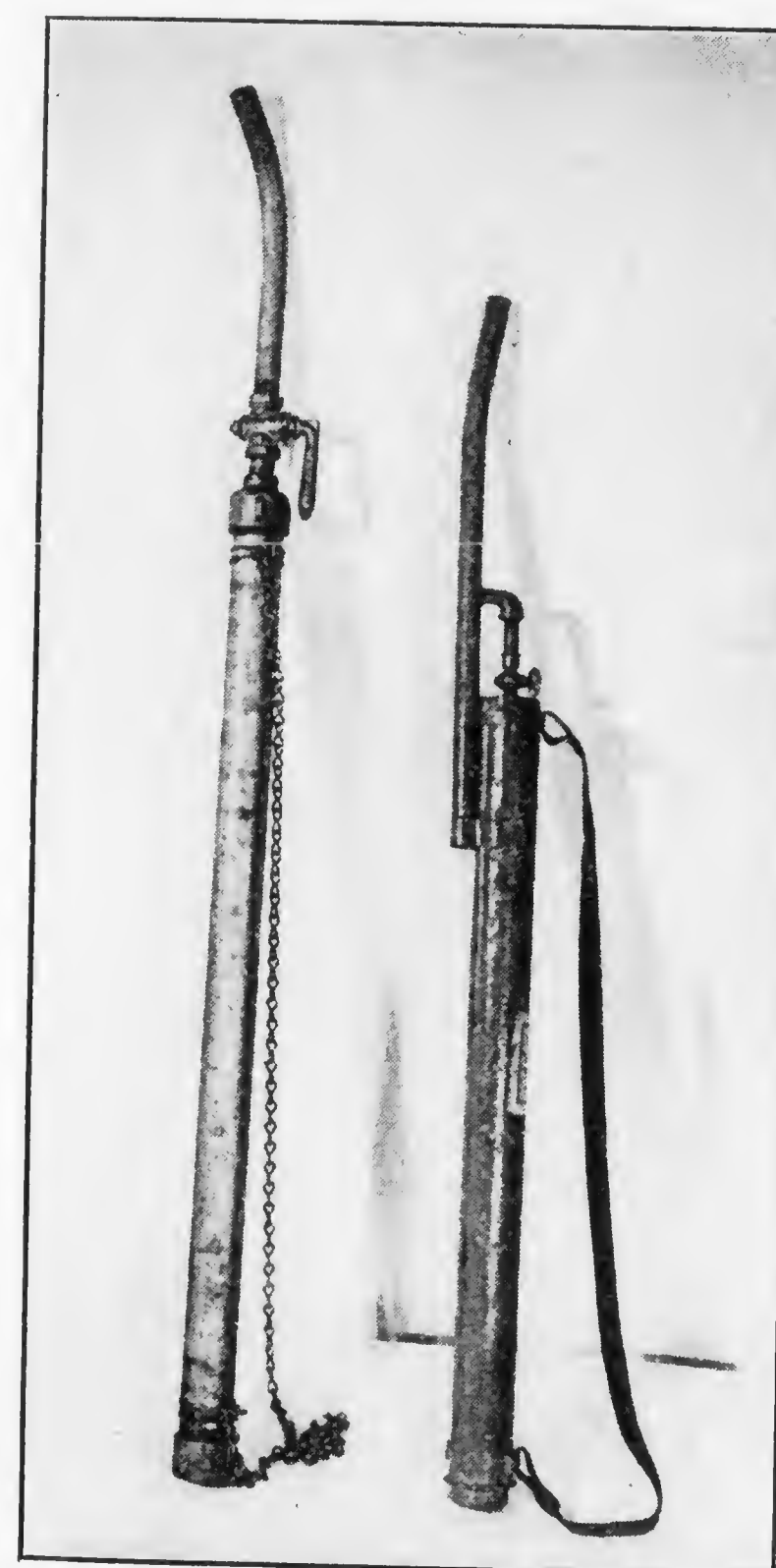
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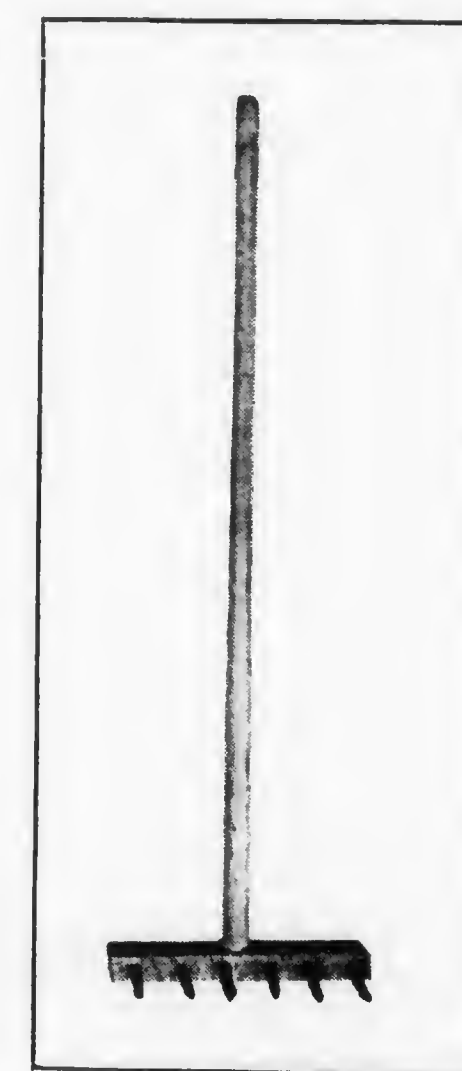
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Back-fires Are Started With Torches.



A Wooden Rake Makes a Clean Trail.

Some authorities do not recommend a back-fire except as a last resort. There is no reason, however, why the principles of back-firing may not be used at every fire, no matter how small. Some persons recommend that a fire should be attacked where it is first met. This point, however, may be where it is doing the least damage. The essential point in forest protection is not merely to put a fire out, but to put it out in the shortest possible time, to restrict it to minimum area and damage. Therefore it should be attacked where it is making most headway or where it is doing most damage. Some recommend attacking a fire on the side-line near the front. They contend the front is gradually narrowed and weakened until it is easily subdued by reducing the amount of fire and draft. There is some merit to this method, but it is a makeshift.

When fire runs into rocks, or burns over a very rocky area, it may be necessary to do considerable quarrying to establish a safety trail around the burned area. In such cases it may be necessary to start a back-fire at the outer edge of the rocks and let the fire smoulder under them. This should be done only after careful consideration of expense and damage.

In rough hilly country several headers may develop because of topography. The size of the force available will determine how these headers should be handled. After one header has been subdued a change of wind may cause this situation to arise. It is always poor policy therefore, to delay the attack on both side lines. As long as a flame burns, prompt and continuous action is required.



If Worked Straight Across the Head-fire, the Back-fire Must be Long Enough to Check not Only the Narrow Head-fire but also the Full Width of the Fire Behind.

The foregoing illustration is described by a forester as follows: "It is useless to try to head off a fire ascending a steep slope. My

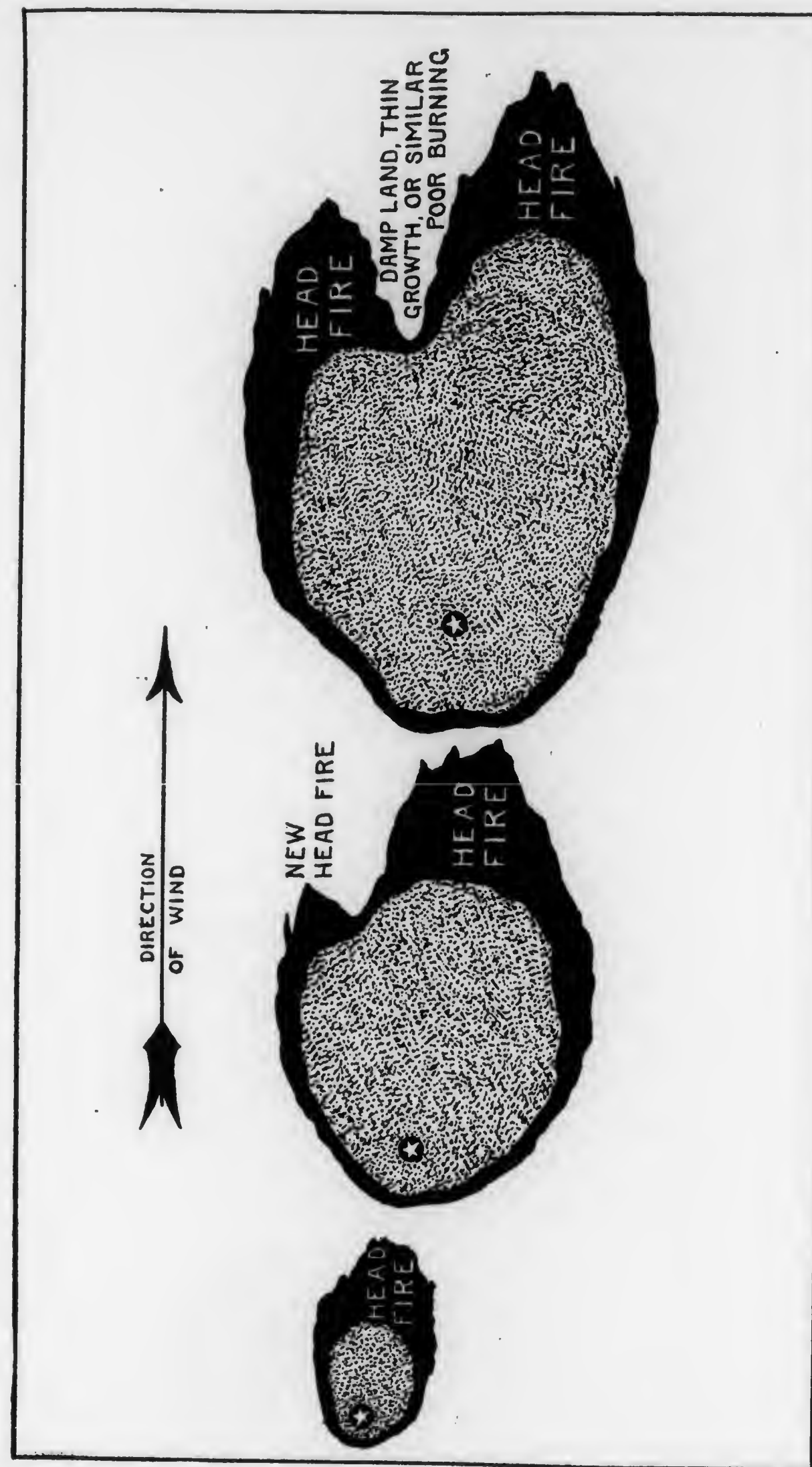
method has been to start a back-fire at the top of the slope, dividing my men into two crews, each running a line away from the other, at right angles to the direction of the oncoming fire until it is safe to run the line down the slope in the direction of the fire, flanking it and finally catching it in the rear." This is a satisfactory method of attack.

Occasionally a back-fire is started at the bottom and diagonally to the slope of a hill. As a result, the uphill draft usually causes the fire to move more rapidly than the men can handle it, and it sometimes gets away. The back fire should be started at the top and worked down, running directly with the wind or at an angle to it. It pays to take the time to walk up a hill before starting the back-fire.

It is advisable to do some thinking after a fire has been extinguished. Review the plan of attack and consider whether better plans might have been made so that the fire could have been more quickly and more easily extinguished.

THE LAST SPARK: No fire is out until the last spark is dead. Sometimes wardens and men leave as soon as the flames have been extinguished, with the result that frequently the fire has started up again at one or more places. Then the fire has to be fought again; it is larger, is harder to subdue, takes more time, costs more, burns over more area, and does more damage than the first fire. No chances should be taken with its breaking out a second time. All but the most dependable men should be discharged. The burned area should be inspected to see that there is no danger of fire creeping across the trail which ought to have been cleared around the burned area. Threatening brands should be thrown far into the burned area; logs and branches holding fire should be rolled over and sprinkled with water or covered with dirt until they are safe. Punky stumps should be examined and broken apart to see that they can give off no sparks. Burning snags standing within several hundred feet of the unburned area should be cut down. Every precaution should be taken to prevent a recurrence of the fire. If a fire has been put out during the day, the tract should be patrolled until the wind goes down in the evening, or until dew falls. If the fire has been extinguished in the morning and there is the least danger of its starting again, the area should be patrolled until the next afternoon or evening.

No fire is out until the last spark is dead.



How a Side Fire May Develop a New Head Fire.

Damage

In estimating damage it must be realized that it is absolutely impossible to arrive at any exact figure, yet it is possible to give a reasonable one. Standing growth may be partly or totally destroyed. Young trees and sprouts may be killed before they are of the size that can be marketed. In such cases the growth is a total loss. This may be estimated on the basis of age. If at 50 years an acre of timber is worth \$25.00, and the stand burned and all killed was about 10 years old the damage may be given at \$5.00 per acre. In other cases only a certain percentage of the standing trees may be killed or rendered valueless. Other trees of merchantable size may be killed, but may be still of value if used within a reasonable time. Still others may not be killed but may be injured more or less. These facts must be kept in mind. It is foolish to report a loss which is greater than the amount that could be obtained from the sale of all the merchantable timber that could be found ordinarily upon a similar area.

It is well to remember, however, that there is **some loss** caused by each fire, even though the growth on the land may be apparently worthless, and even though you may report on your Form No. 15 that there was no loss due to the fact that no value could be obtained from the sale of any material that was damaged. The great damage that forest fires do on apparently worthless land is in preventing valuable growth from becoming established and growing into timber. There is also some loss from the destruction of humus.

Area Burned Over

An area 208 feet (about 75 steps) long and 208 feet wide contains 1 acre.

A circular area with a radius of 118 feet (about 42 steps) contains 1 acre.

An area $\frac{1}{2}$ mile long and $\frac{1}{4}$ mile wide contains 80 acres.

An area 1 mile (5280 feet) long and $\frac{1}{2}$ mile wide contains 320 acres.

An area 2 miles long and $\frac{1}{2}$ mile wide contains 640 acres.

An area 1 mile long and 1 mile wide contains 640 acres.

An area 2 miles long and 1 mile wide contains 1,280 acres.

The Department of Forests and Waters desires to have a complete and accurate statement of the total area of land burned over in each county each year. A warden should make his estimate of acres

burned over only after he has investigated the extent of the fire. Usually this can be done best, at the time of the fire, as it saves an extra trip. By going around the burned area, or by finding a high point from which the whole area is visible, by inquiring of those who assist at the fire, or better by making a sketch of the area and putting in known distances a fairly accurate estimate may be made. A warden should give his own conservative estimate without regard to any claim made by owners. Most Wardens over-estimate area, but some do under-estimate. Some do not try to come near actual figures, but make a guess in round numbers. This is wrong. We do not expect a Warden to make a survey of a burned area, but he is expected to make a reasonable effort to approximate the actual area.

Investigations.

Many Wardens believe that after they have extinguished a fire and submitted a bill their duties have ended. **Each Warden is under obligation to investigate the cause of each fire and to report in detail, without fear or favor, whatever evidence he can collect concerning it.** The investigation can be done best at the time of the fire or immediately after, while the facts are fresh in the minds of those who may know anything of value. The investigation may require time or it may be conducted in a quiet way without loss of time from the Warden's regular work. In case evidence is discovered which may require time or ability which the Warden feels he is unable to furnish, such evidence or clue should be submitted to the District Warden and the matter will be referred to someone for special investigation. A fire bill never should be delayed on account of investigation as to cause of fire. Time of investigation should always be kept separate from time spent in connection with extinction of fire.

In the collection of evidence it is well to use a note book and to write down the name and address of the party interviewed and the statements he makes. If possible, have him sign his name to the statements after they have been read to him. A Warden may place any one under oath administered by himself in order to discover any facts in regard to a forest fire.

The evidence necessary to support criminal action for the violation of law must be clear, definite, and positive. It should be remembered that guilt must be proved beyond a reasonable doubt, and therefore the evidence necessary must be stronger than in civil cases for the collection of damages, where only a preponderance of the testimony is necessary to make out the case. Wardens are concerned with actions for violation of law.

In all cases the name of the trespasser in full should be secured, his place of residence, correct address, his occupation, his whereabouts before the fire, what he was doing at the time of the fire, and names of the witnesses who either saw the act or have knowledge of the circumstances previous or subsequent thereto. This means all facts connecting the party with the fire and includes exact dates.

It is necessary to trace the movements of the trespasser prior to the time of the fire and also to show his movements thereafter, because they will in most cases have a bearing upon his previous actions. These facts tend to rebut any alibi which the trespasser may attempt to prove. In fact, the good handling of cases necessitates securing of facts to overcome a possible alibi.

It may prove valuable at the time of the trial to have some information of the general reputation of the trespasser in the community in which he lives or in the vicinity of the fire; and, in addition, whether he is responsible for other fires in that vicinity.

Affidavits of witnesses familiar with the facts should always be obtained. If they refuse to give affidavits, statements showing the facts to which they can testify should be furnished.

In some cases the suspect may be found near the scene of the fire and admissions or confessions may be obtained from him in the presence of witnesses. In securing such confessions extreme care must be taken that the trespasser is not intimidated in any way or that he is not influenced by any promises of leniency. Such expressions as "It will be better for you if you tell the truth," or any of like character should never be used. The suspected man may be accused of setting the fire, but at the same time it would be preferable to tell him that anything he may say may be used against him.

The reason for these precautions lies in the fact that confessions must be voluntary, and if they are not the court will refuse to allow them to be admitted as part of the evidence. The general rule is that confessions are voluntary when they are made by the person accused under such circumstances that his mind is entirely free from any influence either of fear or favor.

If the result of your investigation or subsequent investigations by someone else develops that the person who started the fire can be held under the criminal law, then the Department expects to take action against that person or corporation. In many cases where criminal suit is not justified the Department is satisfied to present a bill for the cost of extinction. It is, therefore, especially important that the correct name and address of the person responsible for the fire be given.

In case of fire started through railroad operations, a special report on Form No. 19 must accompany regular report on Form 15,

Railroad Section Foremen as Special Forest Fire Wardens.

The policy of appointing railroad section men as Forest Fire Wardens resulted from a conference between railroad officials and officers of the Department of Forestry held at the Capitol, Harrisburg, on March 4, 1920, at which

"It was unanimously agreed that such section foremen as are **recommended** to the Department shall be appointed as Special Fire Wardens with full power and authority, but with **duties** limited to the extinction of forest fires which occur along their respective Rights of Way; reports of all forest fires extinguished by them to be submitted to the Department through any channel recommended by the Railroad Companies."

No appointments are made except upon the recommendation of railroad officials, nor are papers presented or certificates issued to any foreman without the approval of his immediate superior or of his superintendent.

The prime object in appointing section foremen Fire Wardens is to confer upon them the power and authority given wardens by Section 1619 of the Administrative Code, that is, to employ persons to fight forest fires, and if necessary, to draft them for this service. The arrangement does not place added duties upon the foremen, since they are already under instructions from their railroad companies to extinguish all fires occurring along the right of way of which they have charge. The area within which they fight forest fires is not increased, but their authority is.

Each railroad company in Pennsylvania has issued instructions to its employees to prevent the spread of forest and field fires, and section foremen will be governed by their instructions.

The Department of Forests and Waters will not issue orders to railroad men appointed special fire wardens except through their superior officers in the railroad service, and such orders will not interfere in any way with their railroad duties. It will, however, mail to these wardens all circulars issued to local forest fire wardens, in order that they may keep informed on forest fire work.

Instructions from the railroad company cover clearly the necessity of giving precedence to work necessary for the safety of trains and human lives. Unless engaged at the time in vitally important work of this character, the section foreman and crew should go immediately to a fire originating along the right of way and extinguish it. If more vitally important work prevents immediate action on the fire, the responsibility rests upon them to get a fire warden or force of men on the fire as soon as possible.

The responsibility for all forest fires that occur must be fixed. Only in this way can we get at the bottom of the problem and prevent further fires. Full information concerning every fire should be sent promptly through railroad channels to the superintendent or other official designated by the railroad company to receive such reports. The superintendent or other official will forward the report, using Department form No. 15, "Forest Fire Report" to the Department for each fire, no matter how small it may be.

Pay for railroad special forest fire wardens and railroad employees who extinguish fires along railroads will be determined as follows:

- 1.—For fires occurring during regular working hours.
 - (a) If set by operations of railroad—no pay from the State.
 - (b) If railroad is not responsible for the fire—the State will repay the company for the men's time.
- 2.—For fires occurring before or after regular working hours.
 - (a) If set by operations of railroad by whom section-men are employed—time must be submitted to railroad company and payment must come from it—no pay from the State.
 - (b) Not set by railroad operations—men called out by railroad officials.
 - 1—If paid by railroad company—State will repay the company.
 - 2—If not paid by company—State will pay the men through the District Forester.
 - (c) Not set by railroad operations—men not called out by railroad officials Special Warden acts on his own initiative and calls out men—State will pay men through the District Forester.

Bills and statements of cost of extinction should accompany the reports of fire to which they belong and must reach the Department of Forests and Waters within sixty days after date of fire.

Badges.

Each Warden will be furnished with a badge. This he should wear at all times during the fire season and on any other occasion when he may be obliged to show his authority as an officer.

Authority. (See Section 1620, Administrative Code.)

A fire warden as a citizen and as an officer of the law has a right to carry fire arms; however, the Department of Forests and Waters discourages the carrying of arms except where it seems necessary

for self defense. If they must be carried, they should never be concealed.

A fire warden as such is not a fish and game warden. He has no authority to enforce any laws except those relating to the protection of forests. However, as a good citizen he will report to the proper officer the violation of any laws which come to his notice.

Brush burners frequently request the presence of a fire warden during the burning of brush. The law relating to fires in the oil and gas regions requires that fire wardens be present when fires are set during the open season. In such cases the land owner or the person desiring or insisting upon the presence of a warden must pay the warden for his time. The presence of a warden does not relieve the person responsible for the fire from any liability in case the fire escapes into adjoining property.

Sample Forms.

Wardens should not forget that all bills and reports according to law must be in the hands of the Chief Forest Fire Warden **within sixty days after the fire occurred**. Bills coming to him after sixty days will not be approved. It is, therefore, the duty of each Forest Fire Warden to make up the bills and reports promptly and send them to the District Forester immediately after the fire. Do not let more than a week elapse until this is attended to. Don't overlook any names that should be included on bills. Get everything together and get it right the first time.

Bills for fire fighting are paid by the State Treasurer only when supported by evidence that they are just and correct. When a warden is appointed, he takes the oath that he will return true reports and correct and true bills. There is a penalty under Section 1001 for rendering a false or fraudulent statement.

Remember that wherever there is an item of expense except labor there must be an **itemized** receipt.

Do not send in your bills and reports until you have gone over them fully. Make sure that each question is answered. The bill and report will be returned to you for correction unless it is made out properly the first time.

Every question on these forms is asked because an answer is wanted. If a question is asked and you do not know the answer, say so in the space provided.

In each case where a forest fire was started **through a railroad operation**, Form No. 15 must be accompanied by a special railroad fire report Form No. 19. When you send in a bill and report for railroad fire, send Form No. 19 along. (See sample forms in back of this bulletin). The bill will not be paid and your report and bill

will be held up until Form No. 19 is supplied. Railroad section men should not hesitate to give true and honest reports on Form No. 19 for the railroad company is just as interested in having true reports made as is the Department of Forests and Waters.

Where it can be determined who is responsible for a forest fire the Commonwealth renders a bill to that individual in order to collect cost of extinction. It is, therefore, very important that Form No. 19 as well as lines No. 6 and 7 on Form No. 15 be filled out correctly.

When the Fire Warden submits his bills and reports, he should look them over carefully and make sure of the following points:

1. Is the date you are sending in the report within a reasonable time after the fire occurred?
2. Have you answered every question?
3. If a railroad started the fire, have you submitted Form No. 19?
4. Have you a receipt for each item except labor?
5. Is the receipt itemized?
6. Have you forgotten any items of expense?
7. Have you given the names and addresses of the individuals owning the land which was burned over?
8. Have you signed your name at the bottom of Form No. 16?
9. Remember! **Do not pay your men in advance**, as checks already made out will be sent to you for distribution.

If you need any more blank forms, get them from the Inspector when he calls upon you, or send a postal card to the District Forester, telling him what you need.

Instructions to Forest Fire Wardens. (Back of Form 16)

The forest fire warden shall be paid for the time actually employed in the performance of his duties, and for his necessary expenses actually incurred therein.

Persons employed in the extinction of forest fire shall be paid for their services except as follows:

"No owner or lessee of land upon which fire may burn or be started, nor any person during employment with such owner or lessee nor any other person with a present vested interest in such land, shall receive compensation under this act for extinguishing fire upon his land or the land to which his interest is attached," unless the land is listed with the Dept. of Forests and Waters under agreement that not less than 10 cents per acre per year is spent for the better protection, management and development of such land for the present and future timber supply.

"No person who is responsible for the spreading of a fire to a woodlot, forest, or wild land, nor any person in his employ, may receive compensation from a fire warden for helping to extinguish such fire."

Bills of expense must reach Harrisburg within 60 days after they have been incurred. The sooner they are received the sooner they can be paid.

Fire bills, must be written in ink, or upon a typewriter.

For all charges other than regular pay for time, itemized receipts must be furnished.

Receipts must be made in the name of the fire warden and signed by the person rendering service. Receipts for use of teams and automobiles must give number of miles traveled.

Receipts must be made and signed in ink.

Amounts for which receipts are obtained must be placed upon the forest fire bill, as per sample below, and included in the total.

In computing the amount due a man, no fraction of a cent should be placed in the amount column. An extra cent should be allowed in case of $\frac{1}{2}$ of a cent or more; anything less than $\frac{1}{2}$ of a cent should be dropped.

When more than one forest fire warden attend the same fire, the time of all wardens and employees should be submitted in one bill.

Never pay the men in advance. Checks already made out for each man will be sent by the district forester to you for distribution.

This bill does not require an affidavit.

(Sample Bill)

March	26-27, 1921	To John Jones, Forest Fire Warden,	29 hrs. @ .30	8.70
"	26	Jas. Peer, Employee,	12 hrs. @ .15	1.80
"	26-27	Frank Speer,	27 hrs. "	4.05
"	27	Abe Walter,	8 hrs. "	1.20
"	27	Mike Donely,	8 hrs. "	1.20
"	27	James Ewing as per receipt for team hire,		2.00
			(\$18.95)	
April	3	To John Jones, Forest Fire Warden,	15 hrs. @ .30	4.50
		Warren Snyder, Employee,	15 hrs. @ .15	2.25
		John M. Long,	15 hrs. "	2.25
		John Varner,	15 hrs. "	2.25
		William Bates,	15 hrs. "	2.50
		J. W. Benner as per receipt for auto		2.50
		A. H. Sieber as per receipt for lunches,		.75
			(\$16.75)	
				\$35.70

Form 19.

PENNSYLVANIA DEPARTMENT OF FORESTS AND WATERS

SPECIAL RAILROAD FIRE REPORT

- Name *Thomas Whittaker.* Warden—Address *Mountain Home*
- Fire started: Date *April 15* Hour *1:30 P. M.* County *Monroe* Twp. *Barrett*
- Name of R. R. responsible for fire *D. L. & W.* Division *Scranton*
- Time fire was reported to warden *1:35 P. M.*
- Time warden started for fire *1:38 P. M.* Time arrived with crew *2:00 P. M.*
- Who reported it? *Towerman* Address *Snow Hill*
- Cause of fire *Engine Sparks*
(engine sparks, chuders, burning right-of-way, ties, etc.)
- Passenger or freight train *Passenger* Engine number *925*
- LOCATION OF FIRE *between mile posts 31 and 32*
(by mile post number, telephone pole number, or distance and direction from nearest station.)
- Which side of track did fire start? *east*
(NORTH, EAST, SOUTH, WEST)
- Did fire start on right-of-way? *yes* Direction of wind *west*
If not, how far from track?
- Condition of right-of-way *not burned*
- Did fire start on timber, brush, or grass land? *grassland*
- Was the R. R. Co. notified of this fire? *yes*
By whom? *me* When *1:36 P. M.* Who was notified? *Station at Cresco*
- What help did the R. R. give? *Section gang*
- Was anyone fighting the fire when you arrived? *yes*
- Who? *Section Gang.*
- Was the fire out when you arrived? *no* Was it under control? *no*
Did you and your men help put it out? *yes*
- WHY DO YOU STATE THAT THE FIRE WAS CAUSED BY THE R. R.? *It started near the tracks on a heavy grade*
- Did you talk with the Section foreman? *yes* One of the crew? *yes*
What is his name? *Conrad Hensler, Cresco*
- Name and Addresses of witnesses who can fix responsibility for fire
J. A. Seguire, Cresco
L. A. Huguenin, Mountain Home
Ray Price, Mountain Home

Form 7.

**PENNSYLVANIA DEPARTMENT OF FORESTS
AND WATERS**

Mt. Pleasant, Pa.,
(Place)

June, 1, 1924
(Date)

Received of the COMMONWEALTH OF PENNSYLVANIA,

Per *V. M. Bearer,*

Two and $\frac{50}{100}$ *Dollars*

For the following Items of Expense, Department Service:

<i>5 loaves of bread @ 10c,</i>	<i>.50</i>	
<i>2 1/2 lbs. cheese @ 40c,</i>	<i>1.00</i>	
<i>10 cans beans @ 10c,</i>	<i>1.00</i>	<i>\$2.50</i>

\$2.50

J. D. SHAFFER, (Store keeper).
(This receipt must be in ink.)

Form 7.

**PENNSYLVANIA DEPARTMENT OF FORESTS
AND WATERS**

Mt. Pleasant, Pa.,
(Place)

June, 1, 1924
(Date)

Received of the COMMONWEALTH OF PENNSYLVANIA,

Per *V. M. Bearer,*

Three and $\frac{30}{100}$ *Dollars*

For the following Items of Expense, Department Service:

<i>Auto hire from Mt. Pleasant to the fire and return</i>	
<i>30 Miles, @ 10c per mile</i>	<i>\$3.00</i>

\$3.00

W. S. HUFFMAN.
(This receipt must be in ink.)

PLAN OF FOREST PROTECTIVE ORGANIZATION.

The time has come for much greater efficiency in our forest fire organization. The number and size of forest fires must be **greatly** reduced and our organization put upon a really efficient basis. Our responsibility has increased. Results must be commensurate with the money expended. The forest area of the State is covered by an observation system that is unsurpassed in the United States. Fire fighting tools are being supplied. Needed telephone lines are being erected.

The remaining unit of the organization to be strengthened is the personnel. The following plan has been devised to bring this branch of the service up to a standard that will make it the best of its kind in the country.

Patrol as formerly used is abolished since it has proved to be in most instances inefficient and costly. A study of patrol service will prove this clearly to you. Instead we have provided a plan of organization, that will insure prompt detection and extinction of fires, inspection and elimination of hazards, fixed responsibility, pay commensurate with service performed, and public education.

Pennsylvania is divided into 24 forest districts, each in charge of a District Forester. As soon as a forest fire occurs the District Forester should be notified as well as the nearest warden. Each district is divided by the District Forester into several sub-divisions, depending upon the size of the District, the nature of the country and the likelihood of fires occurring. In general, the sub-divisions should contain from 50,000 to 150,000 acres of forest land, and will be in charge of an Inspector. The Inspector may be the Forester's Assistant, a State Forest Ranger, or a specially detailed fire warden, who will be responsible to the District Forester for the satisfactory protection of the area.

All recommendations for appointments will be made by the District Forester.

INSPECTORS

The position of Inspector meets a long felt need for a man who will have active and detailed supervision over a comparatively limited area, make inspections of hazards, make investigations of fires, and have a constant check on the work of the Towermen, Fire Bosses and Wardens.

The Inspector will be the right-hand man of the District Forester in the area allotted to him, and will be in immediate charge of the fire situation in that territory. He must be capable of making a good impression on the people with whom he comes in contact, honest, hard-working, and impartial. He must be a good organizer.

and fire-fighter, and must be capable of making investigations into the causes of fires. He must have some means of conveyance of his own, a horse, automobile, or motorcycle, and should have telephone communication. His activities will in general be confined to private land, except where a State Forest Ranger is detailed for this duty. Preference shall be given in appointments to the best of the present Wardens if suited for the work or if they can serve. He is not a patrolman and shall not be used for that purpose.

DUTIES:—His duties will be to

A—Inspect:—

1. All Sawmills.
2. Railroads.
3. Roads.
4. Other hazardous conditions.

B—See to it that the fire organization is in order at all times to meet any emergency, report to District Forester all indications of inefficiency, and make recommendations for improvement of the organization.

C—Have direct charge of the Fire Wardens in the area assigned to him and to keep them alive to the need for prompt action when their services are needed.

D—Keep in touch with the towermen.

E—Take charge of any fire on which he is needed, especially in case the Warden immediately in charge needs additional help.

F—Investigate all fires in his territory.

G—Check up on all fire fighting equipment in the hands of Fire Bosses, its use and condition.

H—Visit schools.

I—Put up posters.

J—Make a semi-monthly report to the District Forester on Form 34 setting forth his

1. Activities for the period.
2. Recommendations for the betterment of the organization.

COMPENSATION:—He will be paid by the day or hour for the fire season.

He must be a Fire Warden and may be paid for fire fighting at rate allowed a Fire Boss.

TOWERMEN

A Towerman shall be in charge of his tower and shall be responsible for its condition. He must be reliable, energetic, have good eyesight, and must be capable of reading and understanding maps. He must know his region thoroughly. He must have knowledge of the general behavior of fires and must be capable of exercising good judgment in the reporting of them. He must be courteous and must be able to talk intelligently about the protective organization in the territory under his observation. He must be neat. Rangers shall not be used regularly as towermen. The Towerman must be a Forest Fire Warden and present Wardens who are satisfactory must be given preference in appointment.

DUTIES:—The Towerman shall be responsible for the prompt detection and reporting of all fires that occur on the area under his observation and his duties will be to

A—Report all fires to the Fire Boss nearest the scene of the fire, giving the

1. Location and extent as accurately as possible.
2. Direction the fire is burning.
3. Approximate number of men necessary to promptly extinguish it.
4. Apparent cause.

B—Keep the District Forester and Inspector informed as to the progress of all fires and report the need of additional help.

C—Keep the telephone line to the tower in repair.

D—Maintain everything in and around the cabin and tower in a neat and cleanly condition.

E—Do such other work as may be assigned to him during wet weather.

F—Make a daily report by telephone to the District Forester during dangerous seasons.

G—Make a semi-monthly report in duplicate to the District Forester on Form 36.

COMPENSATION:—He shall be paid by the day or hour for the fire season and shall be expected to furnish his own sustenance and bed clothing. The Department will provide a stove, also fuel where it can not be cut locally by the Towerman.

FIRE BOSSES

Fire Bosses and their crews will constitute the mainstays of the extinction forces.

The Fire Bosses shall be the best Fire Wardens situated in the most advantageous places for the prompt extinction of fires and should be men who are comparatively independent, such as farmers, storekeepers, etc. Most State Forest Rangers may be detailed for this duty. A fire Boss must be honest, reliable, energetic, a good fire fighter, and organizer. He must have a telephone either in his home or one close by that is available for his use at all times. He must appreciate the value of minutes in fire extinction. He **shall not** be used for patrol duty.

DUTIES:—The duties of a Fire Boss will be to

- A—Organize and maintain an efficient crew of fire fighters that will be willing to answer a fire call at all times or, if necessary, several crews.
 - B—Remain at his station during all periods when there is danger of fires occurring.
 - C—Respond to all fire calls promptly.
 - D—Have charge of the crew at the fire.
 - E—Have charge of the fire in the absence of the Inspector and to promptly and efficiently extinguish it.
 - F—Report on Form 15 all fires he helps to extinguish.
 - G—Render a correct statement of the expenses in connection with the extinction of fires.
 - H—Use properly and keep in good condition all fire fighting tools placed in his care.
 - I—Investigate, under the direction of the Inspector, the causes of the fires he extinguishes.
 - J—Keep in touch with the Inspector and call upon him or upon the Towerman for assistance.
 - K—Submit to the District Forester and the Inspector a list of his crew as soon as it is organized.
- By having the Fire Boss submit the names of the members of his crew a complete record of personnel is had and a check provided for the District Forester in auditing the fire bills.

FIRE CREWS.

Fire crews shall be made up of reliable men who are good fire fighters and are interested in the prevention and extinction of fires.

Small regular crews (4 to 8 men) can be better trained, organized, equipped, and transported than larger ones. The monetary

inducement to join a crew will be the higher wage rate than is to be paid to men not members of crews.

DUTIES:—They shall be willing to go to a fire at any time they are called by the Fire Bosses. The crew is under command of the Fire Boss, and is responsible for the prompt and efficient extinction of all fires.

COMPENSATION:—Regular crews shall be paid a rate higher than the ordinary untrained fire fighters.

PATROLMEN

Patrolmen **shall not** be employed except in case of emergency as to time and hazard and only when authorized by the Chief Forest Fire Warden. Their qualifications are the same as those of Fire Bosses.

DUTIES:—A Patrolman's duties shall be specific and be assigned to him by the District Forester. He shall be under the immediate supervision of the Inspector.

COMPENSATION:—He shall be paid an hourly wage for the time actually employed.

WARDENS

They will constitute the reserve force of the organization and may be called upon at any time to assist in the extinction of fires. They will be directly under the supervision of the Inspectors. Everything possible must be done to keep up the morale of this volunteer force but by a proper development of the organization now planned the less desirable of the present Wardens can be dropped.

The carrying out of the above plan of organization will enable the District Forester to keep in direct touch with what is going on in his district and will relieve him of many of the minor details of the work. However, with a more extensive system much better results are required and his responsibility thereby is increased.

Rangers may be used as Inspectors or Fire Bosses according to the best results to be obtained.

Appointment of Inspectors, Towermen, Fire Bosses, and Patrolmen where authorized, will be made thru the District Foresters. A Form 31 (notice of Appointment of Patrolmen and Towermen) will be filled out for **each** man. In case of the appointment of Inspectors and Fire Bosses, the title should be written on the line after the words "Patrolman or Towerman". In the case of Towerman the name of the tower he is to man should be written on the same line.

Towermen will submit reports in **duplicate** semi-monthly (1st to 15th and 16th to 31st) to the District Forester on Form 36 (Towerman's Report.)

Inspectors will make out Daily Report sheets (Form 80) and submit them semi-monthly together with "Inspector's Report" Form 34, to the District Forester. The District Forester will retain the sheets from Form 80 but will forward the original copy, Inspector's Report (Form 34) to the Harrisburg Office.

For the information of the U. S. Forest Service a monthly record of the amount of time spent by all of our men on elimination of forest fire hazards and what they do will be kept. Inspectors, Patrolmen, and others should be instructed to enter this data separately on their reports.

Twice a month the Forester will submit a statement of the amount due each Inspector and Towerman for the preceding half-month's services, together with a distribution sheet (Form 82) and the original Towerman's and Inspector's Reports for the half month, (Forms 36 and 34).

EQUIPMENT:—It is the Department's plan to place a supply of forest fire fighting tools in the hands of Rangers, Inspectors, Fire Bosses and some forest fire wardens in key positions. This is being done as quickly as the money available will allow. A start has been made, however, and if tools have been supplied to you please read these instructions carefully.

INSTRUCTIONS AS TO CARE OF TOOLS

When you received the tools you signed a receipt for them (your record may be kept on page 45 of this Manual). You are responsible for their safe keeping. Be sure to keep track of them at a fire and see that they are all returned to you promptly after each fire is out.

The best plan is to have an understanding that each crew member looks after certain tools.

Have a place for the tools and each one in place.

Hang them up—do not lay them on the floor. They will rust and become lost quickly when just "lying around".

Inform your crew and your family where they are.

Keep them clean, dry, and sharp.

Keep the torches filled and see that you have plenty of extra wicking on hand.

Do not use the State's tools for work in the garden, on the wood pile or in camping. If you do tools might as well not be furnished for when the emergency comes they will be dull, broken, rusty, clogged and lost.

See that all tools are marked as property of this Department.

In case any tools are broken, lost or are unserviceable, immediately notify the District Forester or Inspector so that they may be replaced before need for them again arises.

Keep the axe handles securely in the axes.

After a fire check up on the tools.

Don't lift or carry the spray tank by the hose. Use the handle or strap.

Keep canteens and canvas buckets dry when not in use.

The canvas bucket must become thoroughly wet before it will hold water. The buckets are used to carry water for use in the spray tanks.

It is a good plan to keep axes and saws covered with a thin coating of lard. Oil the catch on the Rich Tool to keep the movable parts in order.

New handles will be furnished for broken ones when necessary.

If you have any questions to ask about the tools write the District Forester or call Inspector and tell him.

Right Now, before you forget it, see that the tools are all ready for duty.

Place 19.....
Date

Today I received the following forest fire fighting tools from the Department of Forests and Waters.

	Number
Double Bitted axes	
Hand axes	
Canteens	
Canvas buckets	
Torches	
Wicking	
Spray tanks	
Rich fire tools	

.....
Fire Warden.



FROM ONE TO SEVERAL HUNDRED THOUSAND ACRES ARE VISIBLE FROM INDIVIDUAL FOREST FIRE TOWERS IN PENNSYLVANIA. THIS VIEW OF POTTER COUNTY IS FROM THE CHERRY SPRINGS TOWER.

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF FORESTS AND WATERS
LEWIS E. STALEY, *Secretary*



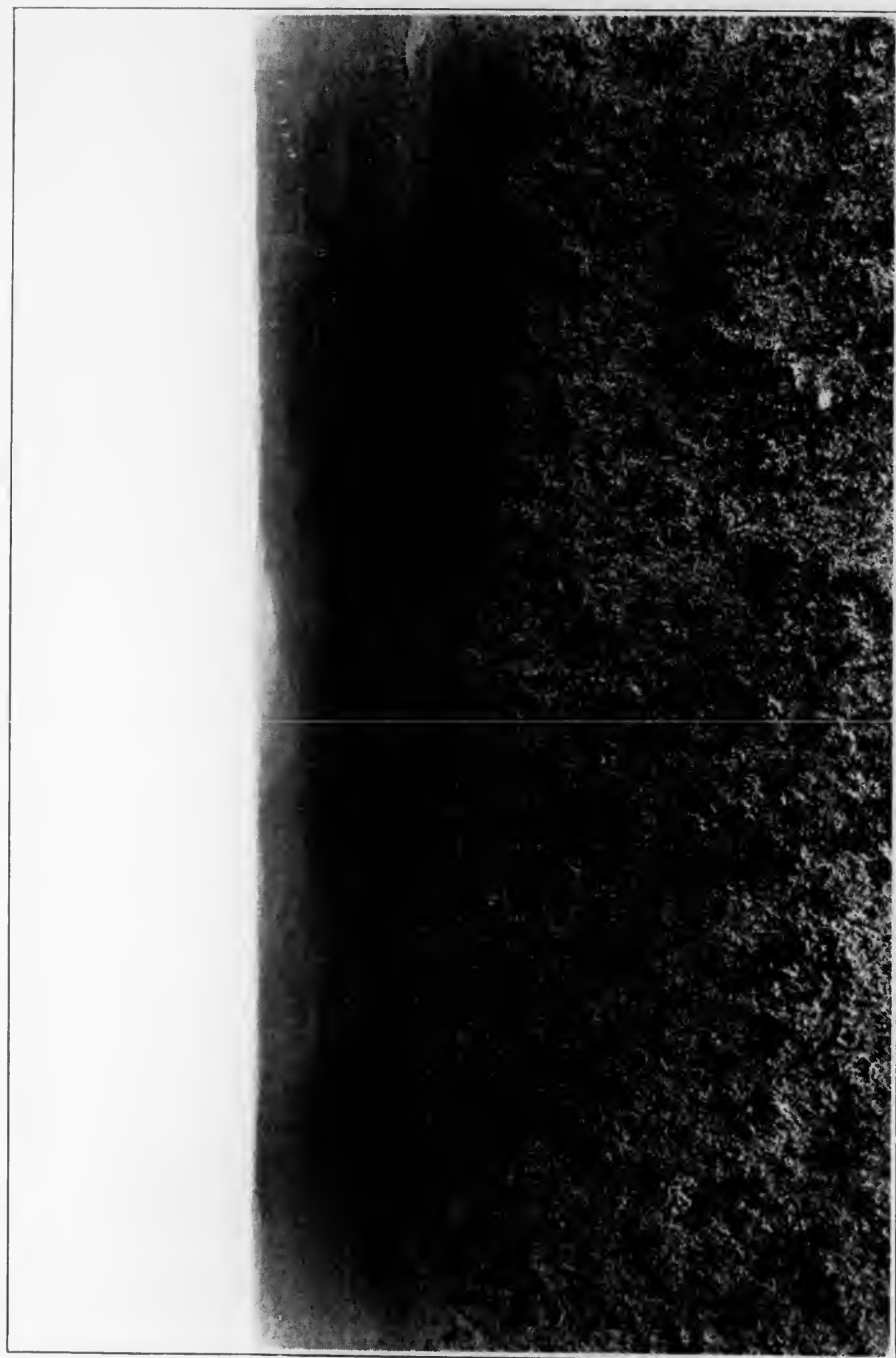
PENNSYLVANIA FOREST FIRE WARDEN MANUAL

By GEORGE H. WIRT

BULLETIN 36
(Revised)

HARRISBURG, PENNSYLVANIA

1931



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HARRISBURG, PENNSYLVANIA

1931

INTENTIONAL SECOND EXPOSURE

FOREWORD

Until the people of Pennsylvania are more careful with fire in and near woodlands than they are with fire in their own homes, there will be forest fires. Until the forest owners in Pennsylvania care for their property and by reason of close utilization of the forest crop keep their woodlands free from unnecessary inflammable debris, forest fires will continue to be the beginnings of possible calamities. In the meantime the Commonwealth—the people organized for mutual protection—must maintain an organized force to prevent such calamities by preventing as far as possible the start and the spread of forest fires.

There is in existence now in Pennsylvania an organization of forest fire wardens with a Chief in Harrisburg, a District Warden in each of the twenty-four Forest Districts into which the State is divided, and more than four thousand local forest fire wardens who live in or near the woodlands throughout the State. From these local wardens certain ones are chosen as inspectors who serve as assistants to the District Wardens during the forest fire seasons. Others are chosen to serve as towermen on the hundred and more towers manned during each fire season, and still others are chosen for other special duties.

But no matter how efficient the Chief or the District Wardens, Inspectors, Towermen, and special duty men may be, when a fire starts its extinction depends upon the local warden with his crew of fire fighters. It follows, therefore, that a Manual which will enable them to become more proficient in the performance of their duties should be placed in the hands of the Wardens. The information presented in the following pages has been prepared with that object in view. However, this Manual should also be of interest to forest land owners and others concerned with the protection of forests from fire and with the general welfare of their Commonwealth.

Credit is herewith given to Charles R. Meek, formerly Assistant to the Chief Forest Fire Warden, and to many District Foresters, for their suggestions and help rendered in the preparation of the first edition of the Manual.

GEORGE H. WIRT
Chief Forest Fire Warden

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PENNSYLVANIA FOREST FIRE WARDEN MANUAL

Classes of Forest Fire Wardens

Referring to the law¹ it will be found that there are three classes of Forest Fire Wardens.

The first is the (1) LOCAL FOREST FIRE WARDEN who is appointed by the Chief Forest Fire Warden, because he is particularly interested in forest protection, and who is paid only for time spent in actually extinguishing fires or in the performance of other assigned duties. Employees of the Commonwealth in the Department of Forests and Waters, the Board of Game Commissioners, the Board of Fish Commissioners and the Pennsylvania State Police, who are on salary, are (2) EX-OFFICIO FOREST FIRE WARDENS. They are not paid extra for fighting fires but their duties and powers are the same as those of the LOCAL FOREST FIRE WARDEN.

Certain persons may be designated as (3) SPECIAL FOREST FIRE WARDENS. They are not paid by the Commonwealth for fighting forest fires, due to the fact that their duties in their regular employment cover this work. Railroad section foremen who have been appointed as SPECIAL FOREST FIRE WARDENS come under this class.

Badges

Each Warden will be furnished with a badge. This he should wear at all times during the fire season and on any other occasion when he may be obliged to show his authority as an officer.

Authority (See Section 1821, Administrative Code.)

A Fire Warden as a citizen and as an officer of the law has a right to carry fire arms; however, the Department of Forests and Waters discourages the carrying of arms except where it seems necessary for self defense. If they must be carried, they should never be concealed.

A Fire Warden as such is not a fish and game warden. He has no authority to enforce any laws except those relating to the protection of forests. However, as a good citizen he will report to the proper officer the violation of any laws which come to his notice.

¹Act of April 9, 1929, P. L. 177. Sections 1818 and 1820.

Brush burners frequently request the presence of a Fire Warden during the burning of brush. The law relating to fires in the oil and gas regions requires that Fire Wardens be present when fires are set during the open season. In such cases the land owner or the person desiring or insisting upon the presence of a Warden must pay the Warden for his time. The presence of a Warden does not relieve the person responsible for the fire from any liability in case the fire escapes into adjoining property.

The responsibilities of the Warden and the authority granted him are expressed in the oath of office, which every Warden is required to take upon his appointment. The form of this oath is given on the following page.

Relation of Forest Fire Wardens to the Public

Forest Fire Wardens should remember that they are serving the public, which expects and is entitled to good service. Faithful performance of duty will reflect upon themselves and the Service. They should be courteous and prompt, exercising tact and good judgment. They should endeavor to make sure that every one understands the main points of the fire laws. They should strive to prevent violation of the fire laws, and give advice rather than warning. Since all human efforts are co-operative, the most useful Warden is one who understands the other fellow best.

Education

Each Warden should talk forest protection at every opportunity, cautioning or warning people who may be careless in the use of fire in the woods. He may induce merchants and others to have forest fire statements printed on checks, bill heads, letter heads, envelopes, calendars, and other printed matter. Above all things he must catch the spirit of fire prevention himself or he cannot transmit much enthusiasm to others.

The Department of Forests and Waters has different posters relative to the protection of the forests from fire. Each Fire Warden should have these distributed properly throughout his neighborhood. Permission should be obtained from landowners and those in charge of buildings before putting up posters. Care should be taken to use only small tacks in putting up posters as large nails injure trees and are difficult to remove and are of course too large to be readily used on card board. Frequently the Warden can get Boy Scouts, sportsmen, autoists, owners of woodland, and others, to distribute posters if he will supply them.

FORM 75.

PENNSYLVANIA DEPARTMENT OF FORESTS AND WATERS

COMMONWEALTH OF PENNSYLVANIA } ss:
COUNTY OF }

I, _____, do solemnly affirm { that I will support, obey and defend
the Constitution of the United States and the Constitution of this Commonwealth; that I will discharge the duties of Forest
Fire Warden for the Department of Forests and Waters of this Commonwealth with fidelity and that I will execute the
orders and directions of the Secretary of Forests and Waters promptly and to the best of my ability; that I will not re-
ceive directly or indirectly any money or other valuable thing for the performance or non-performance of any act or duty
pertaining to my office other than the compensation allowed by the Department of Forests and Waters; that I will keep care-
ful and accurate records of the work performed by me in the manner specified and required by the Department of Forests and
Waters; that I will render to the Department of Forests and Waters a true and correct account of time and cash expenditures
within 60 days of such expenditures; that time so expended and expense so charged shall have been necessarily incurred in the
performance of my official duties; and that upon severing my connection with the Department of Forests and Waters I will
surrender the badge, the certificate of appointment, and all other property belonging to the Department of Forests and Waters,
then in my possession.

Sworn and subscribed before me this

_____ day of _____ 193_____

My Commission expires _____

Forest Fire Warden



FOREST PROTECTION POSTERS DISTRIBUTED FREE BY DEPARTMENT OF FORESTS AND WATERS. THOUSANDS OF POSTERS ANNUALLY ARE USED BY FOREST FIRE WARDENS AND WOODLAND OWNERS IN ALL PARTS OF PENNSYLVANIA.

The amount of good that fire notices do depends very much upon the judgment used in placing them. They should be placed along roads, woods trails, fishing streams, at camp sites, and picnic grounds, and at other places where people collect or pass frequently. Along roads they should be placed on curves, bridges, cross roads, and where travel is slower than on straight stretches. Department posters may be placed along State Highways. Indoor notices should be placed in post offices, railroad stations, stores, town halls, shops, factories, garages, livery stables, blacksmith shops, offices, hotels, school houses, and wherever people congregate. Old posters torn or defaced should be replaced with new ones. Sportsmen's associations especially should be asked to assist in posting notices just before spring fishing season and fall hunting season. Wardens should send to the District Forester for as many posters as may be needed and upon their receipt all should be posted or distributed at the earliest opportunity. They do no good lying around. (For law on defacing signs see Sec. 1009, Act of 1925, P. L. 158, and 1929 P. L. 52.)

The Department issues small fire prevention circulars from time to time. A supply of these should be on hand constantly so that they can be distributed to individuals or groups of people at opportune times. Some Wardens make regular visits to the schools within their territory and distribute such circulars to the school children, explaining their work or having the teachers make such explanation.

Perhaps our most effective effort along educational lines is among children. It is easy to make a lasting impression on their minds and to convert them to an effective conservation movement. The school children, Boy Scouts and Girl Scouts are going to be the sportsmen, Forest Fire Wardens and law makers of the future.

In several cases Wardens have induced business firms to inclose a copy of one of the circulars to each of their patrons with the firm's correspondence. Circulars will be forwarded upon request, as will other kinds of available publicity material.

There will always be some people who are careless and indifferent. For such there must be some regulation and finally some punishment. For this reason the cause of each fire should be investigated promptly and the person responsible should be prosecuted. It is only by persistently enlightening the public on the evils of forest fires and making the careless and indifferent pay the penalty for their acts that the forest fire problem can be adequately met. Brush burning and clearing of new ground in the spring is responsible for a great number of destructive fires. This is a problem that we must face. No brush burning should be done by anyone unless he fully understands



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Perhaps our most effective effort along educational lines is among children. It is easy to make a lasting impression on their minds and to convert them to an effective conservation movement. The school children, Boy Scouts and Girl Scouts are going to be the sportsmen, Forest Fire Wardens and law makers of the future.

In several cases Wardens have induced business firms to inclose a copy of one of the circulars to each of their patrons with the firm's correspondence. Circulars will be forwarded upon request, as will other kinds of available publicity material.

There will always be some people who are careless and indifferent. For such there must be some regulation and finally some punishment. For this reason the cause of each fire should be investigated promptly and the person responsible should be prosecuted. It is only by persistently enlightening the public on the evils of forest fires and making the careless and indifferent pay the penalty for their acts that the forest fire problem can be adequately met. Brush burning and clearing of new ground in the spring is responsible for a great number of destructive fires. This is a problem that we must face. No brush burning should be done by anyone unless he fully understands

that he may be the cause of a forest fire and that if a forest fire burns his neighbor's land he is liable for the damage.

Forest Fire Hazards

A forest fire hazard is any property which, by reason of its condition or operation may cause or aggravate forest fires.

The factors influencing forest fire hazards are inflammability, risk and liability.

Inflammability depends upon the ease with which material will ignite, and the amount of material on the ground.

Risk has been defined as "the likelihood of fires starting."

Liability is "the value of property subject to fire risk."

It should be remembered that sometime in the year practically every acre of woodland is a fire hazard. The material on the forest floor may be ignited easily, and it is likely to be set on fire in many ways. But, every acre of forest land cannot be declared a hazard under the law. An engine may throw out sparks, but if it operates only in and through farm lands, it cannot endanger forest land, and consequently it may not be declared a forest fire hazard. The conditions of both forest and engine must be such that a fire is likely to arise from the use of the engine.

The following may be considered as special forest fire hazards in accordance with the law until a ruling is obtained to the contrary. (See Act of April 11, 1929 P. L. 515):

1. Engines of all kinds not provided with effective spark arresters, ash pans, or other equipment to prevent the spread of fire, when such engines operate within 200 feet of woodland, or of other inflammable property likely to spread fire to woodland.
2. Inflammable debris within 100 feet of a steam railroad track. This includes uncleaned woodland which requires cleaning for the completion of a safety strip along the railroad.
3. Inflammable debris located within a radius of 150 feet from a saw mill or other engine operating within woodland, or operating within 150 feet of woodland.
4. Inflammable debris within 25 feet of the edge of the traveled part of a public highway, the clean road bed of an electric railway, or of any other frequented highway.
5. Slash from lumbering operations without a protective strip of 100 feet adjoining woodland.
6. Uncontrolled forest fire.

As used above, debris means such material as slash, mowings, or other wastage, and accumulated forest litter.

It should be understood in unusual or extraordinary cases the Department is not restricted to action based upon the conditions cited above. Its duty is to investigate independently or upon report, all fire hazards and to base its action upon the conditions in each particular case.

An uncontrolled forest fire is undoubtedly a public nuisance and must be abated promptly.

Where any of the foregoing constitute a serious menace, the matter should be courteously explained to the party responsible, and to the owner of the property which constitutes the hazard or upon which the hazard exists. If the hazard is not then removed, it should be reported at once to the District Forester, and if necessary an order for abatement will be sent. The official form of this order is shown on page 14.

PREPARATION FOR FOREST FIRE SEASONS

Notwithstanding all the educational activities that may be put forth for some time to come, and all the preventive measures taken, the fact remains that "the fools are not all dead." We may still expect forest fires. **The wise thing to do is to prepare for them and for their prompt extinction.**

The way to prepare for forest fires is to have your crews organized, to have arrangements for transportation and food, to let everyone in your community know that you are a Fire Warden and ready to respond. If tools have been given to you they should be available and in good condition.

Organization

Each Forest Fire Warden must build up and maintain an effective forest fire organization in his community. It is poor policy to wait until there is a fire before organizing. In the first place, everyone in the community should know who the Forest Fire Warden is and how he may be reached. Each warden should have telephone connection in his own home, or should make arrangements for messenger service with the nearest neighbor having one, to deliver fire messages to him. He should see that his name is listed properly in telephone directories and elsewhere.

The poster giving the name and address of the local Warden (see "M," in illustration on page 10) should be posted extensively throughout his community, and should appear on or near his home. These

PENNSYLVANIA

DEPARTMENT OF FORESTS AND WATERS

BUREAU OF FOREST PROTECTION

HARRISBURG, PA.

ORDER FOR ABATEMENT OF SPECIAL FOREST FIRE HAZARD

To..... Date.....

An inspection of the following described property (owned or operated) by you, namely:

was made by this Department on the..... day of....., 19.....
the report of which inspection is now in this office and shows:

The condition or operation of this property constitutes during forest fire season a Special Forest Fire Hazard, endangering the property of others.

Therefore, pursuant to my duty and authority under the Act of April 11, 1929, P. L. 515, and because of the Special Forest Fire danger, I declare your property to be a public nuisance and hereby notify and order you to abate the nuisance on or before the _____ day of _____, 19____, and advise you that such abatement may be done as follows:

A copy of the law in regard to Special Forest Fire Hazards and fixing penalty for non-abatement of such hazards, when declared a public nuisance by the Chief Forest Fire Warden, is printed on the reverse side of this order. Should you feel aggrieved by the foregoing order, you should apprise me of your reasons, and may, if you desire, appeal to the Secretary of Forests and Waters.

Yours truly,

Chief Forest Fire Warden.

On the.....day of....., 19....., I served the above order
upon.....by.....a true copy of the foregoing
{ with
{ to the person of.....

I accept service of the above order this _____ day of _____, 19____.

things are necessary because of the importance of getting prompt notice of a fire's existence.

In every community there are those who for one reason or another are actively interested in the protection of forests from fire. It should be the aim of the Warden to locate such people, become acquainted with them, and secure their assistance in case of fire. Some of those who may be appealed to are: Land owners, officials and members of forest protective associations, railroad section foremen, Boy Scouts, Game and Fish Wardens, State Police, State Highway officials, County Farm Agents, and Rural Mail Carriers. The Warden should not expect to be notified by any of these agencies if they are not informed that he is a Warden and how he may be reached. Telephone linemen, pipe line walkers, railroad telegraphers, and other people who go back and forth through forested regions, can be induced to give prompt notice of fire. People living in advantageous positions are as good as paid watchmen if properly encouraged and their good will obtained.

Crews and Their Organization

The organization of forest fire fighting crews in the Warden's neighborhood is highly recommended. A captain or crew leader should be named, to whom the crew may look for leadership in case of fire. These "minute men" should be ready to respond immediately when called upon, and should know where to find their fire fighting tools at all times.

The crew should be able to act under a competent leader even if the Warden is not around. Every member should know that the tools must be strictly accounted for; also where transportation can be secured as well as food, if it is necessary.

To do effective work each member of the crew must know in advance what he is expected to do, and what tools he is expected to take, whether axe, rake, torch, fork, shovel, saw, pail, lantern. It is realized that it is not always possible to organize and keep together a crew of men, but a good warden will see to it that he has the support of reliable men in the community for service when the need arises. It will be well to prepare a list of such helpers in advance of the emergency. It must be understood that the Warden is foreman of all men in his crew and this means that to have a good crew he must be a good foreman.

Telephone Information

Your locality is in some Forest District and in this district there is a District Forester whom every Warden in the district should know how to reach by telephone, telegraph and mail. The District Forester makes the appointment of all of his employes and it is only through District Foresters that the State can effectively handle the administra-

tion of more than 4,300 Forest Fire Wardens. In every Forest District there are two or more forest fire observation stations and during fire season the District Forester will provide for observers. When a fire occurs the observer notifies the nearest Local Forest Fire Warden of the fire and also the district office, thus the alarm is spread. If a Fire Warden or any one else discovers a forest fire, in order to turn in the alarm, he should notify the nearest observation station or the district office and also let them know what he is going to do to extinguish the fire.

Alarms

The sooner a fire is reported to a Warden the sooner he may begin his efforts to control and extinguish it. The more thoroughly he can induce the people of his community to notify him promptly, the more efficient he will be. Therefore, he should develop some means of general forest fire alarm to call his crews together. This may be by whistle, bell or other means.

Knowledge of Country

Each Warden should have a map showing roads, streams, hills, woods, etc., in his township. He should know also, how to reach neighboring Wardens and should not hesitate to call upon them for assistance when necessary.

FIRE DETECTION

A lookout for fire must be maintained whenever the woods are dry enough to burn. A Warden should not wait to be told of a fire when he sees it himself. If a Warden sees smoke or is notified of a fire, he should learn its exact location and notify the District Forester.

It sometimes happens that a Warden discovers or is notified of a fire in an adjoining district, or at a place which he cannot locate exactly. He should immediately attempt to locate the fire through telephone communication and find out if any one is looking after it. If he does not succeed in learning of it in this manner, other means may have to be used—he should find out at any rate.

In attempting to locate a forest fire, it is frequently a better plan to find out more about it by means of the telephone than to get a gang of men and an automobile and spend some hours trying to find it. Of course in some sections of the country, telephones are not available, but when you see smoke and you want to find out more about it, call the nearest observation station. Every Warden should have posted beside his telephone the telephone calls for the District Forester, the nearest Wardens and the observation station.



OVERLOOKING PART OF THE ROTHROCK STATE FOREST, MIFFLIN AND JUNIATA COUNTIES, FROM THE
BLUE KNOB FOREST FIRE TOWER.

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Whatever reasonable expense has been incurred in this way will be paid. If the fire is within reach, it is the Warden's duty to look after it. If it is nearer another Warden, that Warden must be notified immediately and information must be obtained as to whether he needs assistance. Should he be absent, people who are close to the fire ought to be instructed to go to it at once, and if the first Warden's presence is needed, he should go promptly. A Warden should not set up limits beyond which he will not go in case he is needed. When in doubt as to whether the fire is under control, there should be no hesitation in going and investigating to one's entire satisfaction.

It is much better to go out on a false alarm than to let a fire get well started.

As stated above, the more thoroughly the Warden interests the people of his community in fire detection, the more efficient he will be. Proper co-operation from local citizens will reduce the necessity for the erection of towers and employment of watchmen.

In connection with fire detection, Wardens should frequent those observation points which are high and afford a commanding view of the locality. The points from which particularly good views can be had should be reported to the District Forester or the Inspector in order that he may have a record of them at times when he may be in position to construct towers or suggest their construction.

Observation towers should be manned whenever there is any danger of fire. Towermen should arrange to remain on the towers constantly from morning until night as instructed by the District Forester.

FIRE SUPPRESSION

Whenever the Warden observes a fire or learns of it, it is his duty to look after it immediately. Prompt action in getting after the fire and in getting the crew out may be the means of preventing enormous destruction as well as stopping fire that would otherwise probably be very difficult to control. No two fires are alike, even though they may occur approximately in the same place. For this reason no hard and fast rules can be made as to how to control them, yet it is good practice to figure out in advance just what could be done in case of a fire at any particular point and time in one's district. Strategy plays as big a part in fire fighting as in warfare.

The men should be taken to the fire in the shortest possible time in as fresh a condition as possible.

It must be remembered that we are employees of the State of Pennsylvania and that we should do our work as efficiently and as economically as we would do if it were for ourselves or a private firm.

Fires are serious and the greatest precautions must be taken in seeing that they are utterly extinguished, but neither time nor auto expense should be used without good judgment as either of them soon makes unnecessarily high bills.

A number of years ago when fires occurred on mountains, people scratched paths about the fields on the upper side of the fences in order to save the fences and the fire was allowed to burn in the other direction. The Department of Forests and Waters is trying to save not only a few fences, but the forests. With these old methods in mind, much so-called fire fighting has developed into following a fire rather than fighting it. Following a fire even with a large number of men will never extinguish it. To extinguish it one must fight it.

Warden in Charge

The Warden is in charge at a fire and he must keep his crew in control at all times. Control of a crew is a fine test of skill and judgment. The different opinions of several men alternately expressed and followed make the attack fitful and much time and labor may be lost. A line of action should be determined upon and then followed fast and hard. If more than eight or ten men are present, they may be divided and a foreman put over each crew. This will avoid idle time and will make possible the control of a fire more promptly. Each man should be set at doing the thing he can do best and the whole force used to best advantage.

Every Warden should have at his disposal and ready for instant use some conveyance to carry several men. If he owns no means of conveyance he should arrange with some one in the community for transportation. The judgment of the Warden should govern the number of men he deems necessary to control the fire.

In general it is better to have too many men than not enough, but there is a limit to this. Ten men are better than eight and fifteen are better than ten, but there is a limit to the number of men that one Warden can effectively direct. Forest fires have occurred at which one or two Wardens and 200 or 300 men have been present and as there were more men than the Wardens could direct, the result was that the whole number did not do as good work as 50 men could have done. Improper leadership is another great drawback in handling a large number of men. Even where a number of Wardens are present, wasted effort is due to lack of cooperation between Wardens. One Warden should be designated as being in charge of the fire and should direct the work of all the other Wardens so that the fire can be properly and effectively extinguished and not allowed to burn hour after hour due to scattered efforts.

Prompt Action

The efficiency of a Warden and his local organization is determined by the time which elapses between the start of the fire and the first attack. There should be no excuse for delay after a fire is known to exist. Quick action reduces expense, loss, hard work, and prevents big fires. Small fires are easily subdued. It is true that fire fighting is more effective in the evening, night, or early morning, but it is a criminal waste to wait until that time to begin.

Call of Crew

Ordinarily, it is not wise to call out more than two or three crews at the first call, unless the fire already has a good start, or that it is likely to become dangerous in a very short time. On the other hand, it is always well to remember that it is better to have one or two crews too many than to be one crew short. If, after reaching the fire it is found that more men will be needed, no time should be lost in sending for additional forces. If necessary, nearby fire wardens should be notified by telephone or telegraph.

Organized Work

Those who go to a fire should report to a warden. If the warden is absent, a foreman should be selected. Too many bosses in a fire-fighting crew slow up the attack. Each crew should be stationed at some important place on the fire line. In this way the fire may be more effectively controlled. For example, at a light surface fire one crew may be sent along the fire line with extinguishers or sprayers followed by men with rakes, shovels, hoes or brooms to clear the ground of litter and prevent the fire from crossing the line. Another crew may be sent for water to keep the spray tanks supplied. Or in case of a fire sweeping through brush and timber, if back-firing is resorted to, the foreman should go ahead and decide on the line from which the back-firing is to be done; one or two axemen should follow, then several men with forked sticks, rakes, brooms, hoes, shovels, mattocks, etc., should clear the trail down to bare earth. One foreman to set the back-fire is usually sufficient. He should be followed by guards, who are sometimes equipped with sprayers or chemical extinguishers, to prevent fire crossing the trail. The rear guard must be the most reliable man of the crew for he must see that the fire line is safe before he moves up the line.

Food for Fire Fighters

The men will often need food while working at a fire, if away from home five hours or more. The Warden should know where food can be

obtained, and should make arrangements previously with his local merchants to supply the same to any messenger whom he might dispatch to get it. It will even be more satisfactory if the Warden and the store keeper make up a few lists of food and agree upon the number of men each list will supply. If it is necessary to go to private homes for supplies one must make the best of what he can get. Wardens must not forget that the Auditor General has ruled that the State cannot pay for "pop" and tobacco. He does not deem these to be necessities and they will not be paid for.

Assistance of Land Owners

The owner of the land or his representative and employees should be among the first to be called out for assistance in fire suppression.

Survey of Fire

Upon arrival at the fire, the Warden should find out as soon as possible what part of the fire is advancing most rapidly, and what timber or other property of most value is likely to be destroyed. He should hunt up the other wardens and learn the plan of attack. Keeping down the area burned over and the amount of damage are the two things for which he must work. He must decide quickly whether to place his men between the fire and the most valuable growth or in front of the most rapidly advancing flames. He should know the distance to the nearest trail, road, brook, or field. He should judge the speed of the fire and how far ahead he must start his attack, and remember not to allow his men to follow the fire but to **fight** it.

It is assumed the Warden will be prompt, and that he and his crew will arrive while the fire is small. But if for any reason a warden must attack a large fire he should take the men to the front; start the attack at a favorable place, and then size up conditions, going entirely around the fire if necessary. No time must be lost, but a half-hour spent in making plans after a complete investigation, may determine the success or failure of the fight.

"For instance, to beat out a hot fire line in the woods within a short distance of a road in a dry time is generally mistaken judgment, since the fire is exceedingly likely to break over again as it would not with the bare soil of the road to help control it; or spreading a limited force of fighters on a long fire line, part of which is headed toward a natural barrier, and part of which is not, weakens the work where most needed and spends effort where unnecessary.

"Fire can be headed or directed into natural barriers like swamps, clearings, old burns, hedges, etc., by choosing which portion of the

head fire to attack first, when the whole fire line cannot be met promptly and effectively because of its magnitude or of lack of help. Judgment used in this way is worth more than hours of labor."—*New Jersey Circular*.

Methods of Fighting Forest Fire

The object of forest protection work is not only to prevent forest fires but also to detect and control those which occur before they grow large. Forest fire does damage not only to present growth but also prevents valuable growth from becoming established on apparently worthless areas. Every forest fire does **some** damage. The efficiency of a Warden and his local organizations is determined by the time which elapses between the start of a fire and his first attack.

Quick action avoids expense, loss, hard work, and the probability of big fires. Small fires are easily subdued, and permit every one's getting back to his regular work in a short time. It is true that fire fighting is more effective in the evening, night, or early morning, but it is extremely bad policy to wait until that time to begin.

A local alarm bell or whistle and a prearranged place of meeting, help greatly. In case other assistance is needed, use the telephone as much as possible or send messengers to various homes. A small, well trained, well equipped crew at the beginning of a fire is worth 50 to 100 men later. One man should be started to the fire at once to make investigations and be ready to report to the Warden upon his arrival.

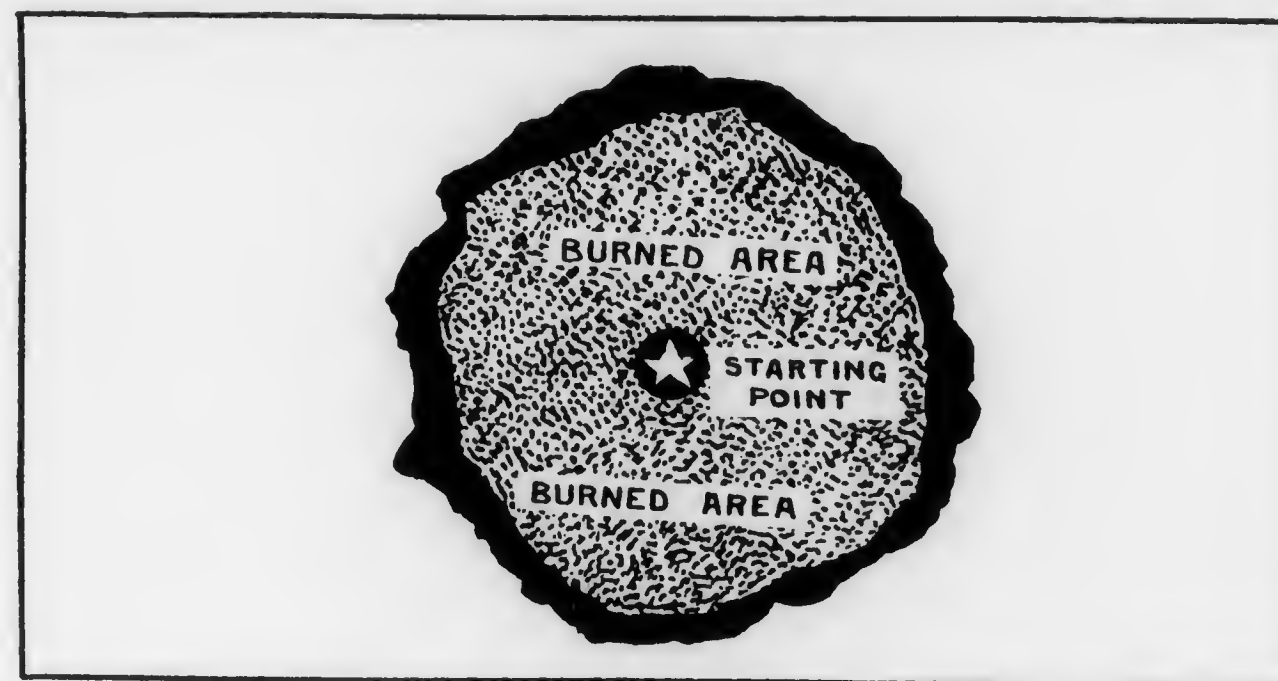
There are many methods of attacking a forest fire. Some are good and some are not. Some may think their method is the only one. A good warden is always ready to receive suggestions of value and is willing to give them fair trial at least. Methods of fighting vary with the character of the fire, character and condition of the forest, condition of atmosphere, strength and direction of wind, rapidity of fire's advance, topography, material on ground, etc.

Tree Fires: Tree fires are stopped by shutting off the air which makes a draft through the hollow trunk. Close the hole at the ground if possible with dirt. If this cannot be done, the ground around the burning tree should be cleared, and the tree should be felled. The fire can then be smothered inside and outside. If water is available, the fire may be put out with force pump or sprayer or chemical extinguisher without felling the tree. Dead snags in forests should be felled as a matter of fire prevention as well as for the benefit of the forest.

Underground Fires: These fires can be stopped only by digging deep enough to prevent their spread. The ditch, as well as the surface should

be flooded if possible. This, however, is seldom possible. Where an underground fire has a good start it may be cheaper to blast a ditch than to dig one. Well-placed dynamite will do effective work in a short time.

Crown Fires: We have few crown fires in Pennsylvania. Natural conditions as to topography and growth are the best means of stopping any that may occur.



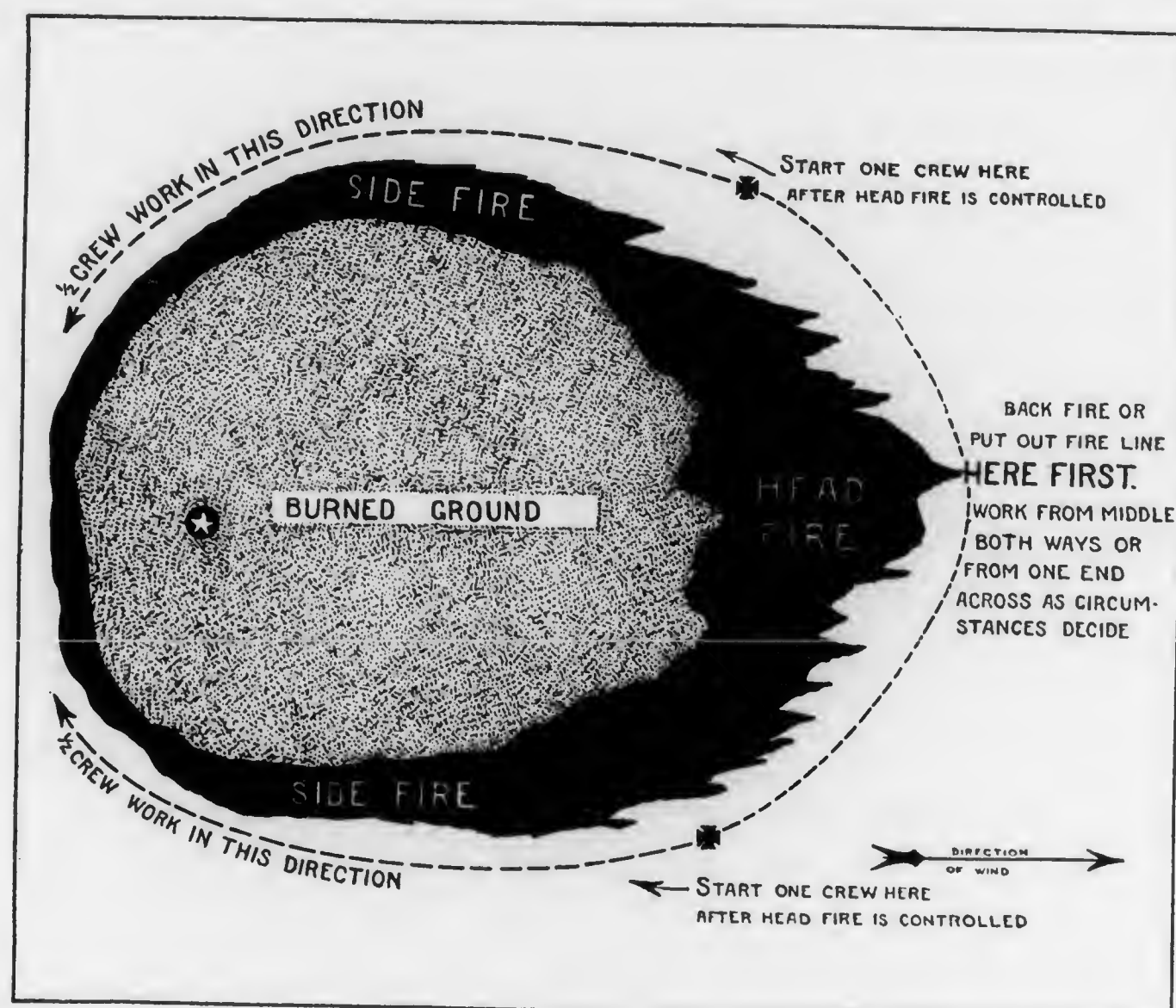
HOW A FOREST FIRE BURNS WHEN THERE IS NO WIND

Surface Fires: This is the kind of fires which occur most frequently in Pennsylvania. If there is little wind the flames may be put out by beating with branches (pine preferred), shovels, and wet burlap. Fire fighters should beat the flames with a side sweep toward the fire to avoid spreading sparks. Sweeping with old brooms, brooms made of branches, or steel brooms, is better than beating. The burning material may be pushed back upon the burned-over ground with rakes, sticks, forks, or other tools. The idea is to separate the burning material from that not yet afire. Water is always effective, but too frequently dependence is placed on it, and when it is not available fire fighters seem to be at a loss to know how to make their attack. The fire can be smothered by throwing on dry or moist sand or dirt. If it is possible to plow, a furrow may be thrown up quickly to restrict the spread of the fire.

Sometimes small or lightly-burning fires are beaten out. If no trail is cleared to the bare ground entirely around the burned area, here and there small pieces of smouldering wood may be fanned into flame and the fire may again break out. **It is always a safe practice to make a clean trail with exposed mineral earth entirely around the burned area.**

Chemical extinguishers are sometimes used. Careful tests have been made by foresters and it has been found that the chemical spray is

of no more value in the woods than is plain water with a little force back of it. This force can be supplied by a foot pump, or by air pressure, as in the ordinary fruit spraying devices. Sprinkling water in front of the fire reduces the force of the flames and permits close beating and raking. To be effective, considerable water is required when it is sprinkled directly on the flames. Water is used to the best advantage when the stream is thrown at the ground immediately in front of the flames. The water and force combined will stop the flame's advance. It is also satisfactory to spray water against the base of the flames from the rear particularly if there is much smoke.

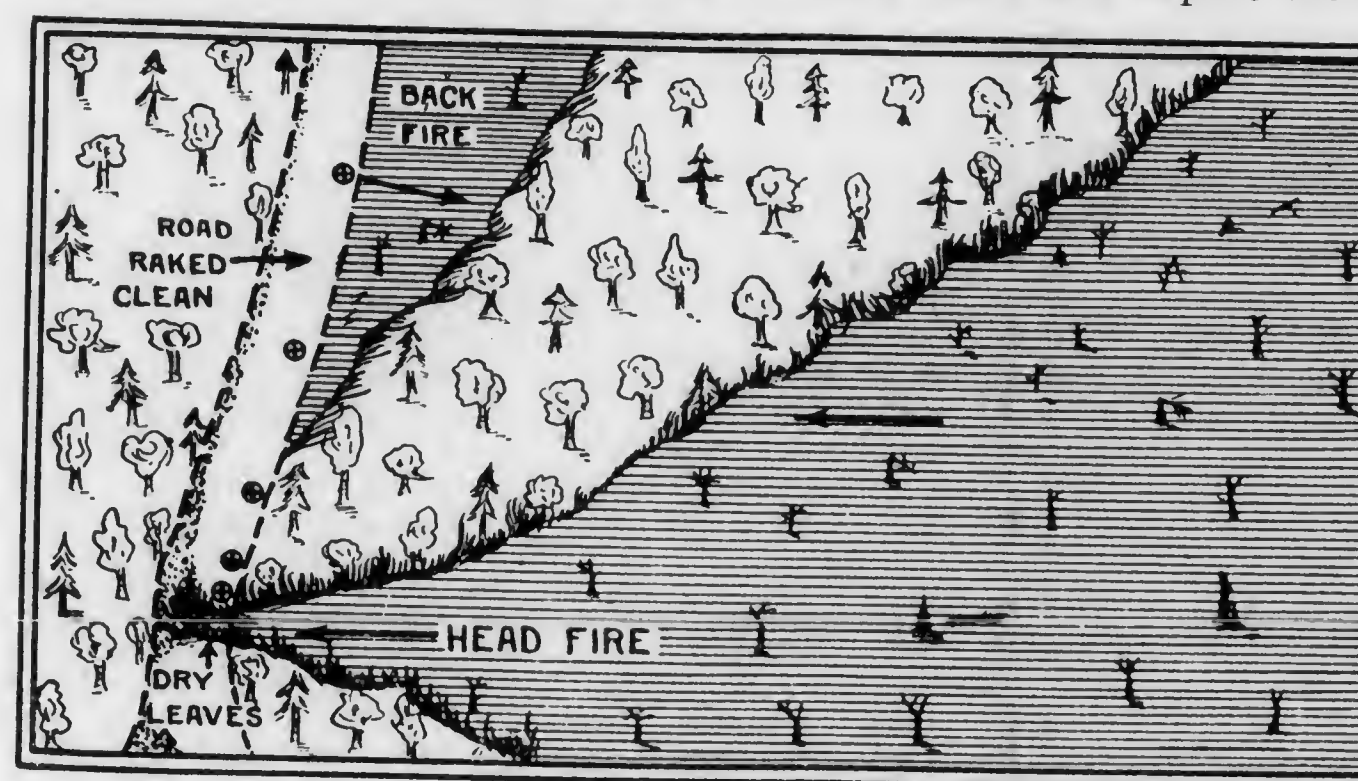


THE CORRECT WAY TO ATTACK ANY FOREST FIRE. ALWAYS WORK FROM IN FRONT TOWARD THE REAR. STOP THE HEAD-FIRE FIRST AND WORK FAR ENOUGH TO EACH SIDE SO THAT THE SIDE-FIRE CANNOT WORK AROUND TO A NEW HEAD-FIRE.

Back-firing: When the wind is strong or when the flames are in slash, fallen logs, dead ferns, bracken, or grass, fire becomes so intense that it is unsafe and impracticable to attempt close attack. Back-firing is resorted to in such cases. It should be remembered that fire is a dangerous force and that when fire is fought with fire extreme care and keen judgment must be used. If a fire starts some area will be burned-over and some growth will be damaged, but in order to reduce the damage as much as possible some additional sacrifice may have to

be made by starting a back-fire. The area to be covered by the back-fire should, however, be kept as small as is practicable.

Frequently under excitement, the speed at which the original fire is traveling is misjudged and a back-fire is started too close to it or too far in advance of it, usually the latter. Occasionally a back-fire has been set at the foot of a mountain along a road to stop a fire just coming over the top. Sometimes a land owner has set a back-fire along his property line without regard to where it may go or where the original fire was. Indiscriminate back-firing cannot be condemned too strongly. A lack of information regarding the locations of fire breaks already established, and the topography, may result in errors in back-firing. (Everyone should be on the watch for such cases and report them.)



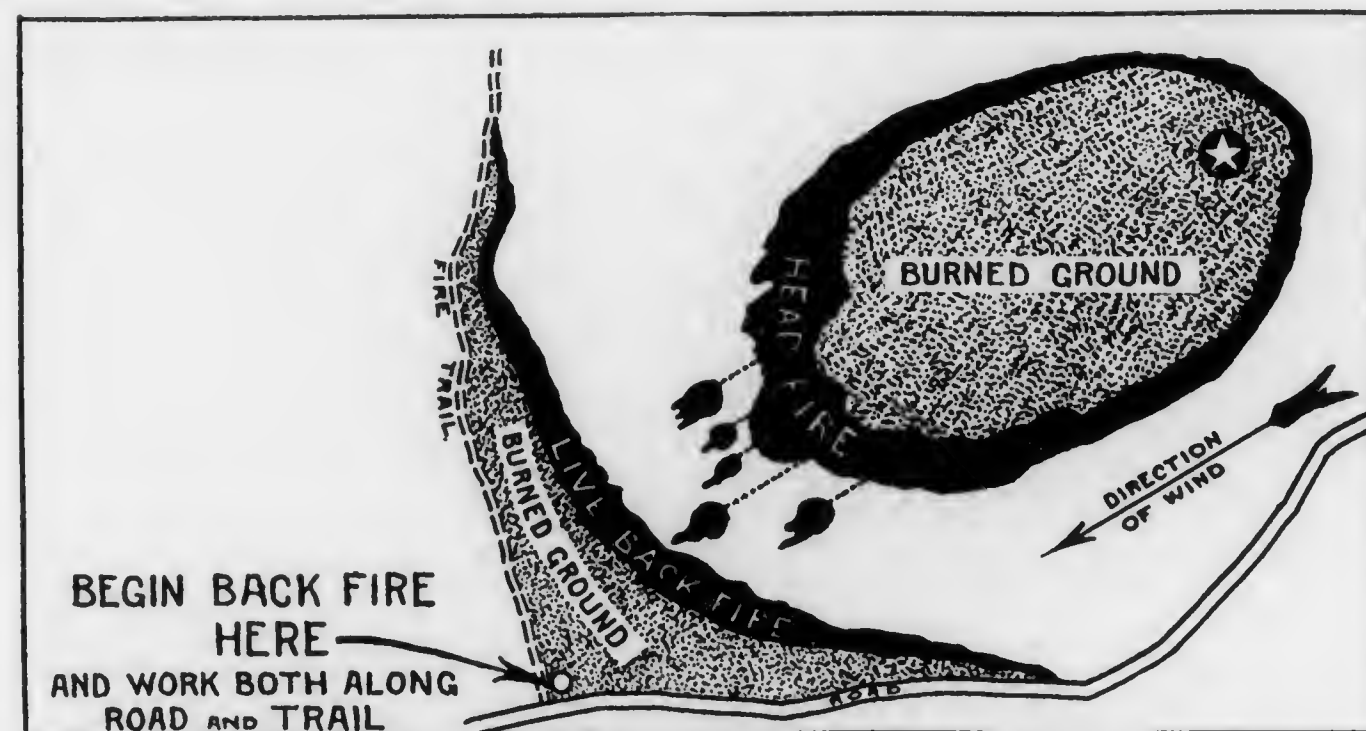
THE INCORRECT WAY TO ATTACK BY BACK-FIRE. THE HEAD-FIRE REACHES THE FIRE-BREAK AND JUMPS OVER IT BEFORE THE BACK-FIRE REACHES THE POINT OF ADVANTAGE.

Such errors should be reported to the person in charge of the fire-fighting crews. After the necessity for starting a back-fire has been determined—and not before—the back-fire should be started as close to the main fire as practicable. Sometimes back-fires do not stop the original blaze. In that case the crew must drop back to a second line of defense and renew the attack. The retreat should be made promptly and the new fight started at once from the most advantageous position.

Fire burns slowly down hill, and rapidly up hill. Therefore a good place to start a back-fire is just over the brow of a hill up which a fire is advancing on the opposite side. Fires burn slowly against the wind and rapidly with the wind. The heat and draft from the advancing fire attracts the heat from the back-fire and hastens the advance of the latter when the two are approaching. Observation of the force and direction of the wind will give warning in time to protect the

men. It will also indicate whether a quick advance should be made to another point that is threatened by the flames.

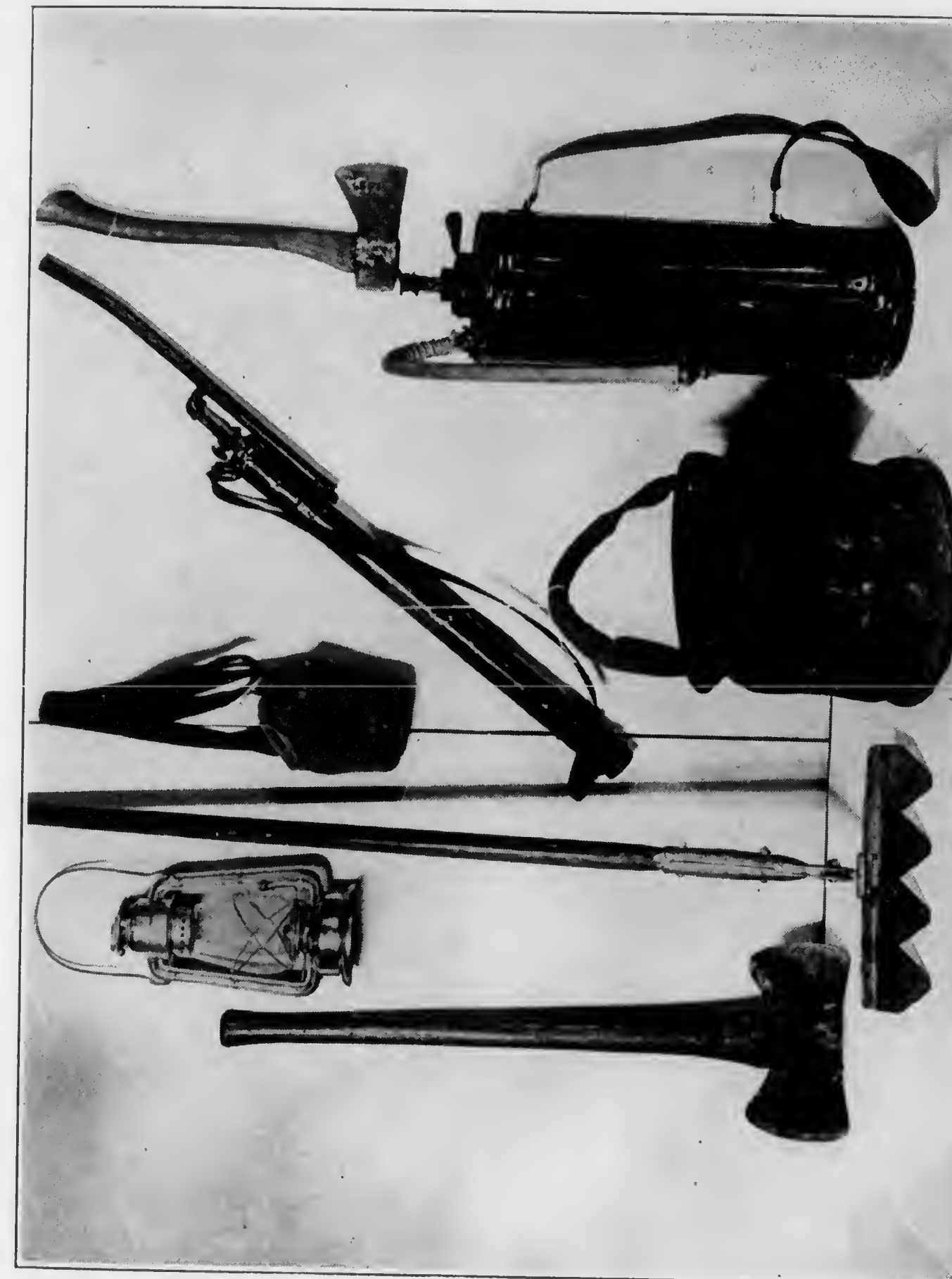
A back-fire should be started from a fire-break, such as a road, stream, or other natural barrier. In case a fire-break is not found at the proper place for back-firing, one must be made. The ground should be cleared so that the damp mineral soil is exposed. Such a trail can be made very quickly even through brush with forked sticks, if no other tools are available. Of course, axes, brush hooks, rakes, hoes, shovels, and brooms are better tools.



WHERE AN ANGLE CAN BE USED A BACK-FIRE MAY HAVE TO BE LONGER, BUT THE AREA BURNED BY THE BACK-FIRE IS REDUCED. BE CAREFUL THAT THE SIDE-FIRE DOES NOT COME UP BEFORE THE WINGS OF THE BACK-FIRE ARE SAFE.

Usually the smoke is thickest, fighting is most uncomfortable, and danger of spark-spreading is greatest in line with the draft of the fire. The back-fire should be started at this point, and every man available is needed there. The back-fire should be started at the lower point of a V, the sides of which are open enough and extended far enough to include the header of the advancing fire. The whole crew is available to attack promptly the spot fires in case sparks cross the fire-break. As soon as the header is halted the side lines of the back-fire may be drawn in close to the side lines of the main fire and continued parallel to them, or even run into them. The rest of the fire-line may be beaten out. Remember, however, that a trail cleared to mineral soil should extend entirely around each fire to make it safe. The crew, even if small, should be divided at the point of the V, with a few more men on the side which should be advanced more rapidly or on which the danger is greater because of the wind.

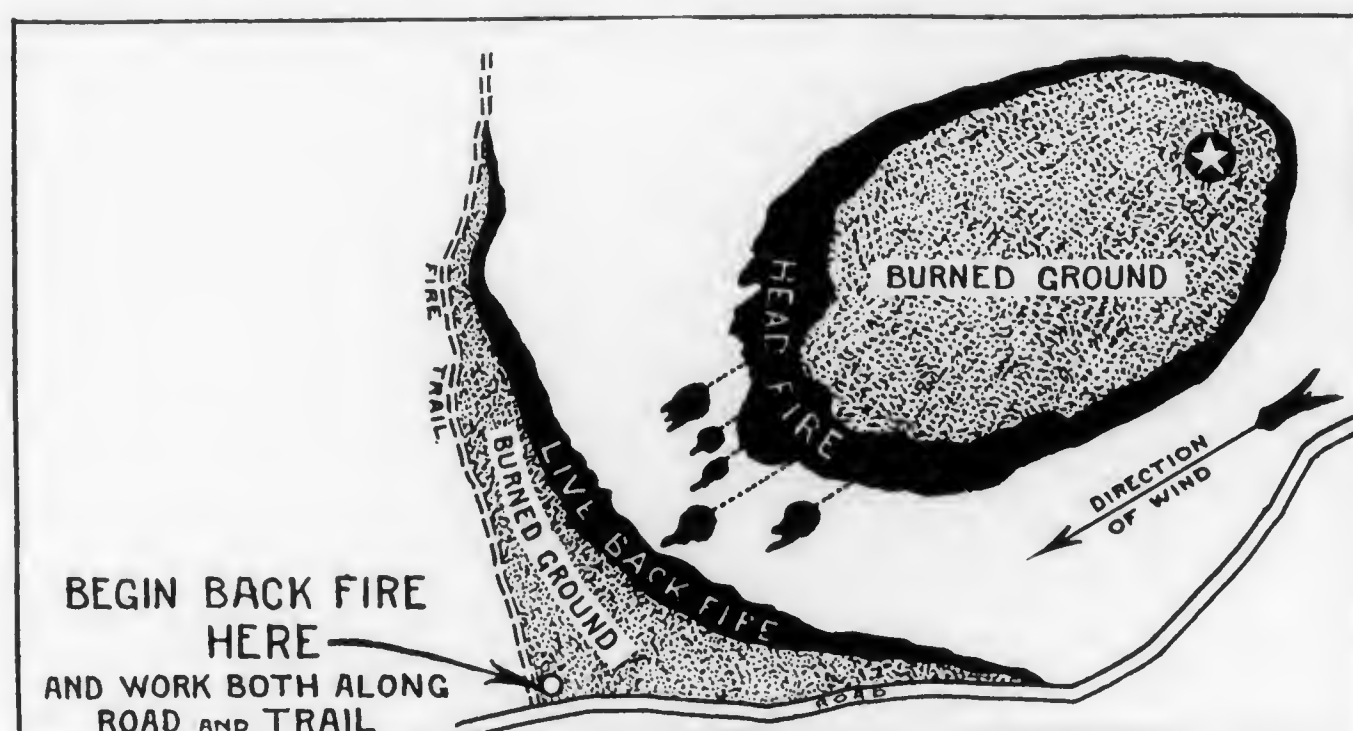
A satisfactory arrangement of crew is as follows: The warden or foreman directs the course and location of the fire-break, if one must be made. He is in charge of the whole fire-fighting force and should



FOREST FIRE FIGHTING TOOLS COMMONLY USED IN PENNSYLVANIA. IN ORDER SHOWN: DOUBLE-BITTED AXE, LANTERN, PATENT FIRE RAKE, CANTEN, BACK-FIRING TORCH, COLLAPSIBLE CANVAS PAIL, HAND AXE, SPRAY TANK.

men. It will also indicate whether a quick advance should be made to another point that is threatened by the flames.

A back-fire should be started from a fire-break, such as a road, stream, or other natural barrier. In case a fire-break is not found at the proper place for back-firing, one must be made. The ground should be cleared so that the damp mineral soil is exposed. Such a trail can be made very quickly even through brush with forked sticks, if no other tools are available. Of course, axes, brush hooks, rakes, hoes, shovels, and brooms are better tools.



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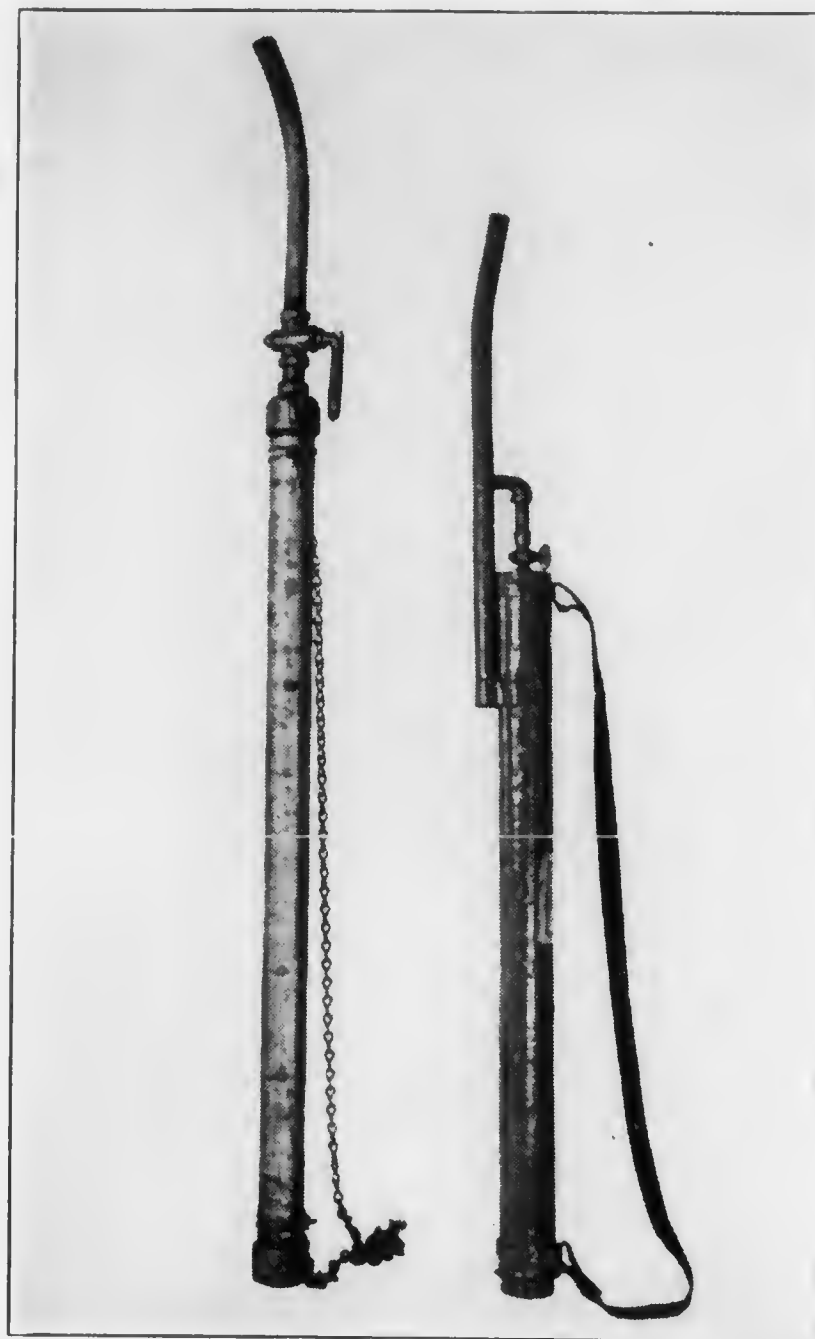
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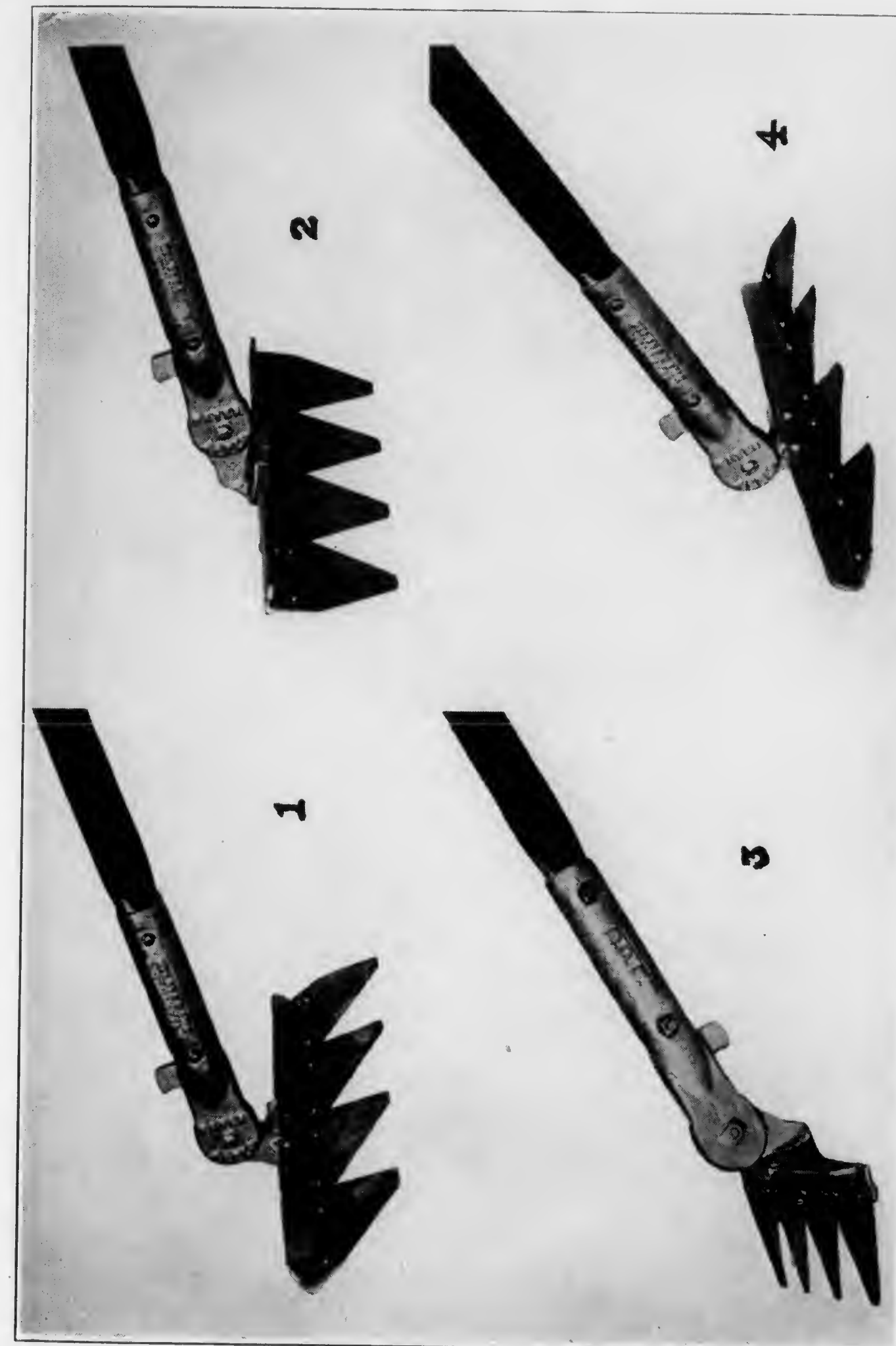
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urge each man to do his best. According to the amount of brush to be cut one or two axemen or brushcutters follow the warden. Four men with rakes, or some other tool, one working close to the other, make a clean trail, exposing the mineral soil, **raking the material to the side away from the fire unless it is needed to start a back-fire.** Next comes a man with a torch. He must not set fire too rapidly for the nearest raker, nor the guards who follow him. If the torchman sets fire too rapidly for the rakers the heat may drive them off their



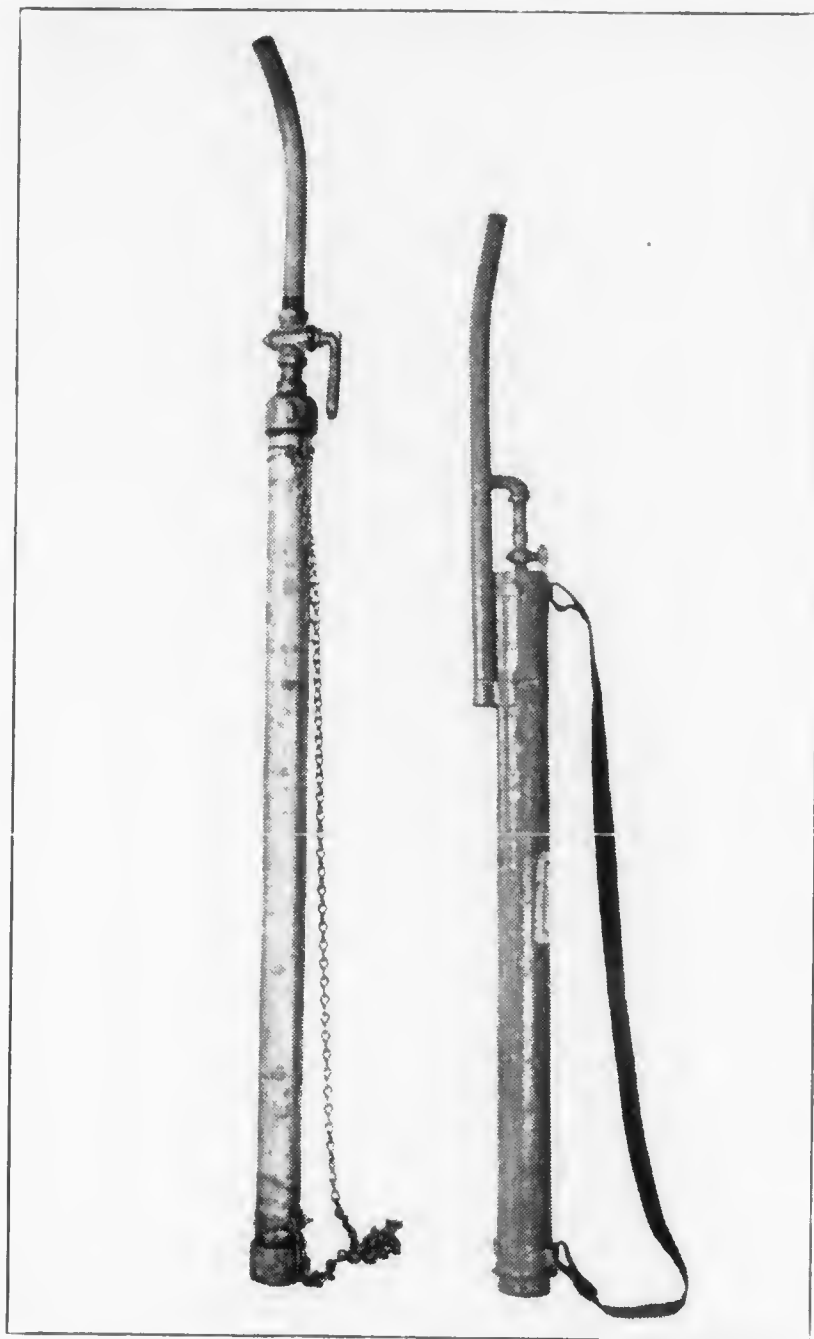
KEROSENE TORCHES ARE USED FOR SETTING BACK-FIRES.

course, and if too rapidly for the guards, the fire may not burn away from the trail fast enough to permit their moving up with the torchman. As a result sparks may blow across the trail where there will be no one to discover and stamp them out immediately. Four alert and active guards can take care of a long line of back-fire. They should have spray tanks and a continuous supply of water. They should have also a rake or broom. Pine brush may be used in the absence of a better tool. The rear guard must be the most dependable man in the crew for he must determine when the line is safe and



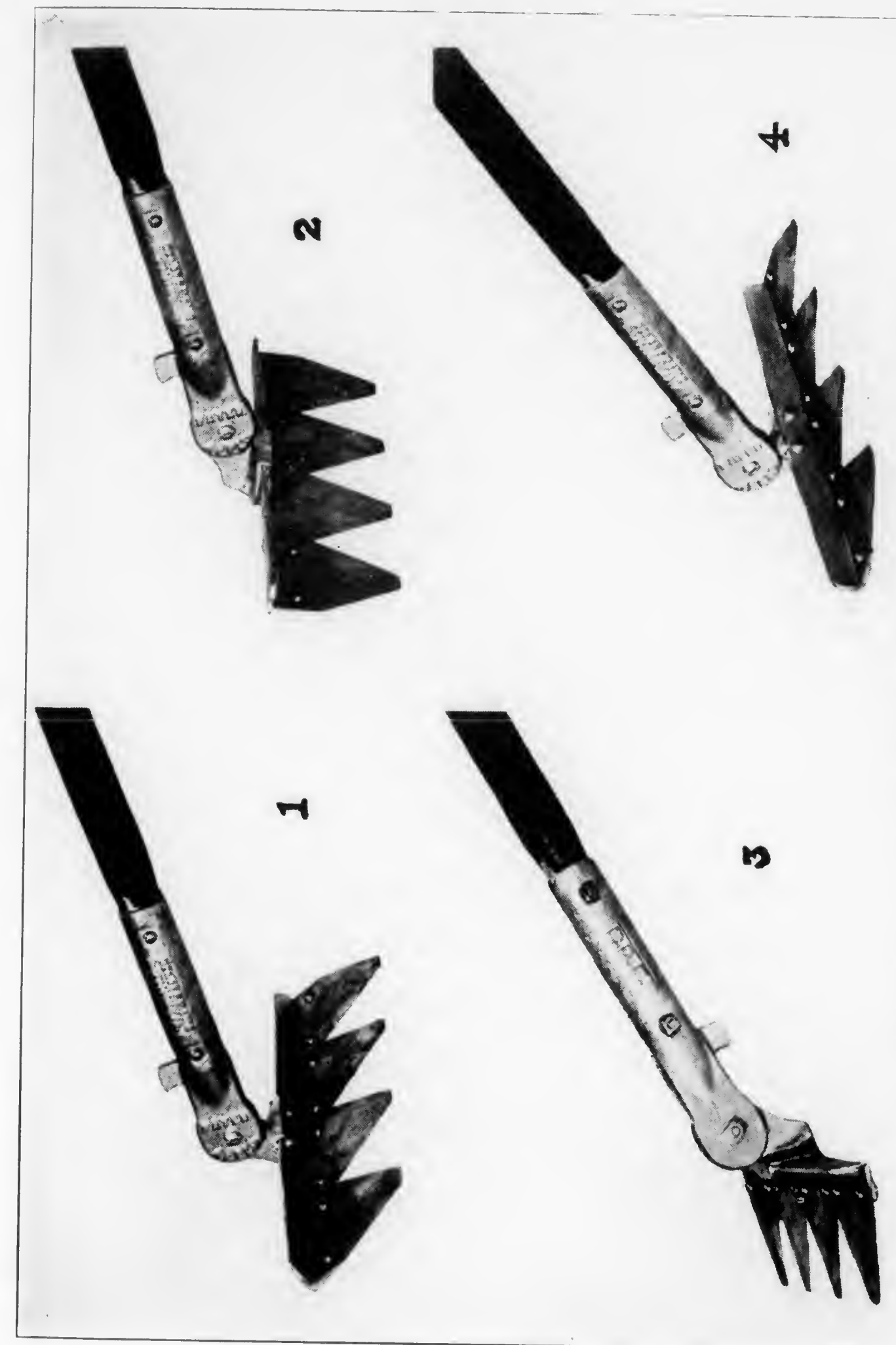
A MODERN TYPE OF FOREST FIGHTING RAKE. IT IS MADE OF METAL, AND CAN BE ADJUSTED TO FOUR POSITIONS, MAKING IT A MOST EFFECTIVE INSTRUMENT. USED (1) AS A DEEP MULCH HOE, (2) LEAF AND BRUSH RAKE, (3) EMBER FORK, (4) BRUSH CUTTER.

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must not leave it until it is safe. It is important that someone who knows the woods after dark should be detailed to carry water.

Some authorities do not recommend a back-fire except as a last resort. There is no reason, however, why the principles of back-firing may not be used at every fire, no matter how small. Some persons recommend that a fire should be attacked where it is first met. This point, however, may be where it is doing the least damage. The essential point in forest protection is not merely to put a fire out, but to put it out in the shortest possible time, to restrict it to minimum area and damage. Therefore it should be attacked where it is making most headway or where it is doing most damage. Some recommend attacking a fire on the side-line near the front. They contend the front is gradually narrowed and weakened until it is easily subdued by reducing the amount of fire and draft. There is some merit to this method, but it is a makeshift.

When fire runs into rocks, or burns over a very rocky area, it may be necessary to do considerable quarrying to establish a safety trail around the burned area. In such cases it may be necessary to start a back-fire at the outer edge of the rocks and let the fire smoulder under them. This should be done only after careful consideration of expense and damage.

In rough hilly country several headers may develop because of topography. The size of the force available will determine how these headers should be handled. After one header has been subdued a change of wind may cause this situation to arise. It is always poor policy therefore, to delay the attack on both side lines. As long as a flame burns, prompt and continuous action is required.

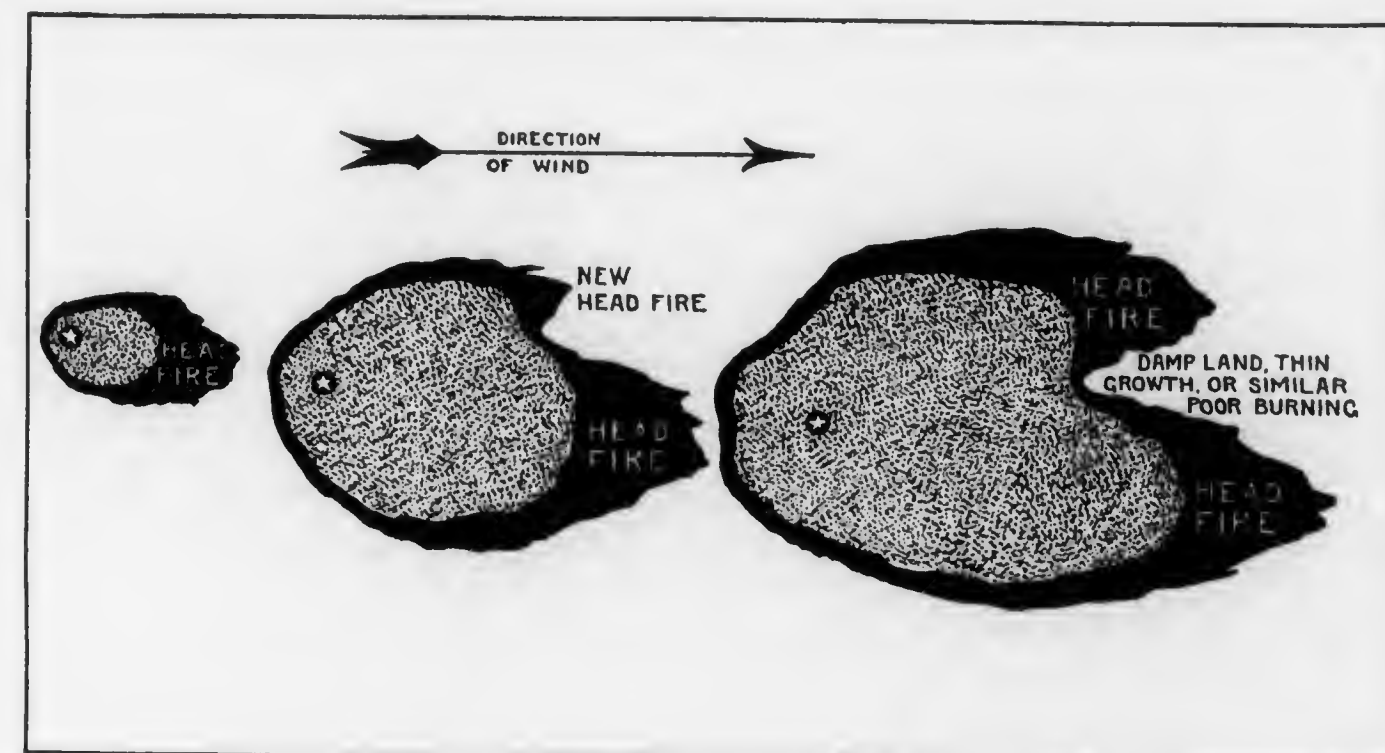


IF WORKED STRAIGHT ACROSS THE HEAD-FIRE, THE BACK-FIRE MUST BE LONG ENOUGH TO CHECK NOT ONLY THE NARROW HEAD-FIRE BUT ALSO THE FULL WIDTH OF THE FIRE BEHIND.

The foregoing illustration is described by a forester as follows: "It is useless to try to head off a fire ascending a steep slope. My method has been to start a back-fire at the top of the slope, dividing my men into two crews, each running a line away from the other, at right angles to the direction of the oncoming fire until it is safe to run the line down the slope in the direction of the fire, flanking it and finally catching it in the rear." This is a satisfactory method of attack.

Occasionally a back-fire is started at the bottom and diagonally to the slope of a hill. As a result, the uphill draft usually causes the fire to move more rapidly than the men can handle it, and it sometimes gets away. The back fire should be started at the top and worked down, running directly with the wind or at an angle to it. It pays to take the time to walk up a hill before starting the back-fire.

It is advisable to do some thinking after a fire has been extinguished. Review the plan to attack and consider whether better plans might have been made so that the fire could have been more quickly and more easily extinguished.



HOW A SIDE FIRE MAY DEVELOP A NEW HEAD FIRE.

The Last Spark: No fire is out until the last spark is dead. Sometimes wardens and men leave as soon as the flames have been extinguished, with the result that frequently the fire has started up again at one or more places. Then the fire has to be fought again; it is larger, is harder to subdue, takes more time, costs more, burns over more area, and does more damage than the first fire. No chances should be taken with its breaking out a second time. All but the most dependable men should be discharged. The burned area should be

inspected to see that there is no danger of fire creeping across the trail which ought to have been cleared around the burned area. Threatening brands should be thrown far into the burned area; logs and branches holding fire should be rolled over and sprinkled with water or covered with dirt until they are safe. Punky stumps should be examined and broken apart to see that they can give off no sparks. Burning snags standing within several hundred feet of the unburned area should be cut down. Every precaution should be taken to prevent a recurrence of the fire. If a fire has been put out during the day, the tract should be patrolled until the wind goes down in the evening, or until dew falls. If the fire has been extinguished in the morning and there is the least danger of its starting again, the area should be patrolled until the next afternoon or evening. **No fire is out until the last spark is dead.**

FOREST FIRE DAMAGE

In estimating damage it must be realized that it is absolutely impossible to arrive at any exact figure, yet it is possible to give a reasonable one. Standing growth may be partly or totally destroyed. Young trees and sprouts may be killed before they are of the size that can be marketed. In such cases the growth is a total loss. This may be estimated on the basis of age. If at 50 years an acre of timber is worth \$25.00, and the stand burned and all killed was about 10 years old, the damage may be given at \$5.00 per acre. In other cases only a certain percentage of the standing trees may be killed or rendered valueless. Other trees of merchantable size may be killed, but may be still of value if used within a reasonable time. Still others may not be killed but may be injured more or less. These facts must be kept in mind. It is foolish to report a loss which is greater than the amount that could be obtained from the sale of all the merchantable timber that could be found ordinarily upon a similar area.

It is well to remember, however, that there is **some loss** caused by each fire, even though the growth on the land may be apparently worthless, and even though you may report on your Form No. 15 that there was no loss due to the fact that no value could be obtained from the sale of any material that was damaged. The great damage that forest fires do on apparently worthless land is in preventing valuable growth from becoming established and growing into timber. There is also some loss from the destruction of humus.

Area Burned Over

An area 208 feet (about 75 steps) long and 208 feet wide contains 1 acre.

A circular area with a radius of 118 feet (about 42 steps) contains 1 acre.

An area $\frac{1}{2}$ mile long and $\frac{1}{4}$ mile wide contains 80 acres.

An area 1 mile (5280 feet) long and $\frac{1}{2}$ mile wide contains 320 acres.

An area 2 miles long and $\frac{1}{2}$ mile wide contains 640 acres.

An area 1 mile long and 1 mile wide contains 640 acres.

An area 2 miles long and 1 mile wide contains 1,280 acres.

The Department of Forests and Waters desires to have a complete and accurate statement of the total area of land burned over in each county each year. A Warden should make his estimate of acres burned over only after he has investigated the extent of the fire. Usually this can be done best, at the time of the fire, as it saves an extra trip. By going around the burned area, or by finding a high point from which the whole area is visible, by inquiring of those who assist at the fire, or better by making a sketch of the area and putting in known distances a fairly accurate estimate may be made. A Warden should give his own conservative estimate without regard to any claim made by owners. Most Wardens over-estimate area, but some do under-estimate. Some do not try to come near actual figures, but make a guess in round numbers. This is wrong. We do not expect a Warden to make a survey of a burned area, but he is expected to make a reasonable effort to approximate the actual area.

Investigations

Many Wardens believe that after they have extinguished a fire and submitted a bill their duties have ended. **Each Warden is under obligation to investigate the cause of each fire and to report in detail, without fear or favor, whatever evidence he can collect concerning it.** The investigation can be done best at the time of the fire or immediately after, while the facts are fresh in the minds of those who may know anything of value. The investigation may require time or it may be conducted in a quiet way without loss of time from the Warden's regular work. In case evidence is discovered which may require time or ability which the Warden feels he is unable to furnish, such evidence or clue should be submitted to the District Forester and the matter will be referred to someone for special investigation. A fire bill never should be delayed on account of investigation as to cause of fire. Time of investigation should always be kept separate from time spent in connection with extinction of fire.

In the collection of evidence it is well to use a note book and to write down the name and address of the party interviewed and the statements he makes. If possible, have him sign his name to the statements after they have been read to him. A Warden may place any one under oath administered by himself in order to discover any facts in regard to a forest fire. (Use Form 113).

The evidence necessary to support criminal action for the violation of law must be clear, definite, and positive. It should be remembered that guilt must be proved beyond a reasonable doubt, and therefore the evidence necessary must be stronger than in civil cases for the collection of damages, where only a preponderance of the testimony is necessary to make out the case. Wardens are concerned with actions for violation of law.

In all cases the name of the trespasser in full should be secured, his place of residence, correct address, his occupation, his whereabouts before the fire, what he was doing at the time of the fire, and names of the witnesses who either saw the act or have knowledge of the circumstances previous or subsequent thereto. This means all facts connecting the party with the fire and includes exact dates.

It is necessary to trace the movements of the trespasser prior to the time of the fire and also to show his movements thereafter, because they will in most cases have a bearing upon his previous actions. These facts tend to rebut any alibi which the trespasser may attempt to prove. In fact, the good handling of cases necessitates securing of facts to overcome a possible alibi.

It may prove valuable at the time of the trial to have some information of the general reputation of the trespasser in the community in which he lives or in the vicinity of the fire; and, in addition, whether he is responsible for other fires in that vicinity.

Affidavits of witnesses familiar with the facts should always be obtained. If they refuse to give affidavits, statements showing the facts to which they can testify should be furnished. (Use Form 113).

In some cases the suspect may be found near the scene of the fire and admissions or confessions may be obtained from him in the presence of witnesses. In securing such confessions extreme care must be taken that the trespasser is not intimidated in any way or that he is not influenced by any promises of leniency. Such expressions as "It will be better for you if you tell the truth," or any of like character should never be used. The suspected man may be accused of setting the fire, but at the same time it would be preferable to tell him that anything he may say may be used against him.

The reason for these precautions lies in the fact that confessions must be voluntary, and if they are not the court will refuse to allow them to be admitted as part of the evidence. The general rule is that confessions are voluntary when they are made by the person accused under such circumstances that his mind is entirely free from any influence either of fear or favor.

If the result of your investigation or subsequent investigations by someone else develops that the person who started the fire can be held under the criminal law, then the Department expects to take action against that person or corporation. In many cases where criminal suit is not justified the Department is satisfied to present a bill for the cost of extinction. It is, therefore, especially important that the correct name and address of the person responsible for the fire be given. (Act of April 3, 1929, P. L. 135.)

In case of fire started through railroad operations, a special report on Form No. 19 must accompany regular report on Form 15.

SAMPLE FORMS

Wardens should not forget that all bills and reports according to law must be in the hands of the Chief Forest Fire Warden **within sixty days after the fire occurred**. Bills coming to him after sixty days will not be approved. It is, therefore, the duty of each Forest Fire Warden to make up the bills and reports promptly and send them to the District Forester immediately after the fire. Do not let more than a week elapse until this is attended to. Don't overlook any names that should be included on bills. Get everything together and get it right the first time. (See **Special Instructions in Time Book**.)

Bills for fire fighting are paid by the State Treasurer only when supported by evidence that they are just and correct. When a warden is appointed, he takes the oath that he will return true reports and correct and true bills. There is a penalty (under Section 1001 Act of June 3, 1915 P. L. 797, as amended by Act of April 26, 1923 P. L. 93) for rendering a false or fraudulent statement.

Remember that wherever there is an item of expense except labor there must be an **itemized** receipt.

Do not send in your bills and reports until you have gone over them fully. Make sure that each question is answered. The bill and report will be returned to you for correction unless it is made out properly the first time.

Every question on these forms is asked because an answer is wanted. If a question is asked and you do not know the answer, say so in the space provided.

In each case where a forest fire was started through a railroad operation, Form No. 15 must be accompanied by a special railroad fire report Form No. 19. When you send in a bill and report for railroad fire, send Form No. 19 along. (See sample forms in back of this bulletin). The bill will not be paid and your report and bill will be held up until Form No. 19 is supplied. Railroad section men should not hesitate to give true and honest reports on Form No. 19 for the railroad company is just as interested in having true reports made as is the Department of Forests and Waters.

Where it can be determined who is responsible for a forest fire the Commonwealth renders a bill to that individual in order to collect cost of extinction. It is, therefore, very important that Form No. 19 as well as Item No. 3 on Form No. 15 be filled out correctly. (Act of April 3, 1929 P. L. 135).

When the Fire Warden submits his bills and reports, he should look them over carefully and make sure of the following points:

1. Is the date you are sending in the report within a reasonable time after the fire occurred?
2. Have you answered every question?
3. If a railroad started the fire, have you submitted Form No. 19?
4. Have you a receipt for each item except labor?
5. Is the receipt itemized?
6. Have you forgotten any items of expense?
7. Have you given the names and addresses of the individuals owning the land which was burned over?
8. Have you signed your name at the bottom of Form No. 16?
9. Remember! **Do not pay your men in advance**, as checks already made out will be sent to you for distribution.

If you need any more blank forms, get them from the Inspector when he calls upon you, or send a postal card to the District Forester, telling him what you need.

Form 19.

PENNSYLVANIA DEPARTMENT OF FORESTS AND WATERS SPECIAL RAILROAD FIRE REPORT

1. Name *Thomas Whittaker.* Warden--Address *Mountain Home*
2. Fire started: Date *April 15, 1930* Hour *1.30 P. M.* County *Monroe* Twp. *Barrett*
3. Names of R. R. responsible for fire *D. L. & W. Division Scranton*
4. Time fire was reported to warden *1.35 P. M.*
5. Time warden started for fire *1.38 P. M.* Time arrived with crew *2.00 P. M.*
6. Who reported it? *Towerman* Address *Snow Hill*
7. Cause of fire *Engine Sparks*
(engine sparks, cinders, burning right-of-way, ties, etc.)
8. Passenger or freight train *Passenger* Engine number *925*
9. LOCATION OF FIRE *between mile posts 31 and 32*
(by mile post number, telephone pole number, or distance and direction from nearest station.)
10. Which side of track did fire start? *east*
(NORTH, EAST, SOUTH, WEST)
11. Did fire start on right-of-way? *yes* Direction of wind *west*
If not, how far from track?
12. Condition of right-of-way *not burned*
13. Did fire start on timber, brush, or grass land? *grassland*
14. Was the R. R. Co. notified of this fire? *yes*
By whom? *me* When *1.36 P. M.* Who was notified? *Station at Cresco*
15. What help did the R. R. give? *Section gang*
16. Was anyone fighting the fire when you arrived? *yes*
17. Who? *Section gang*
18. Was the fire out when you arrived? *no* Was it under control? *no*
Did you and your men help put it out? *yes*
19. WHY DO YOU STATE THAT THE FIRE WAS CAUSED BY THE R. R.? *It started near the tracks on a heavy grade*
20. Did you talk with the Section foreman? *yes* One of the crew? *yes*
What is his name? *Conrad Heaster, Cresco*
21. Name and Addresses of witnesses who can fix responsibility for fire
J. A. Seguire, Cresco
L. A. Huguenin, Mountain Home
Ray Price, Mountain Home

Form 7.

PENNSYLVANIA DEPARTMENT OF FORESTS AND WATERS

Mt. Pleasant, Pa.,
(Place)

June, 1, 1930
(Date)

Received of the COMMONWEALTH OF PENNSYLVANIA,

Per V. M. Bearer,

Two and $\frac{50}{100}$ Dollars

For the following Items of Expense, Department Service:

5 loaves of bread @ 10c,	.50
2 1/2 lbs. cheese @ 40c,	1.00
10 cans beans @ 10c,	1.00
	\$2.50

\$2.50

J. D. SHAFFER, (Store keeper).
(This receipt must be in ink.)

Form 7.

PENNSYLVANIA DEPARTMENT OF FORESTS AND WATERS

Mt. Pleasant, Pa.,
(Place)

June, 1, 1930
(Date)

Received of the COMMONWEALTH OF PENNSYLVANIA,

Per V. M. Bearer,

Three and $\frac{No}{100}$ Dollars

For the following Items of Expense, Department Service:

Auto hire from Mt. Pleasant to the fire and return
30 Miles, @ 10c per mile \$3.00

\$3.00

W. S. HUFFMAN
(This receipt must be in ink.)

Form 113.

PENNSYLVANIA
DEPARTMENT OF FORESTS AND WATERS
STATEMENT OF WITNESS

Commonwealth of Penna. }

County. }

ss:

Before me, the subscriber, a Forest Fire Warden in the said county personally appeared late of
(Occupation)

..... County, who being duly
(township, borough, city)

sworn doth depose and say, that the facts set forth in the following statement are true to the best of his knowledge and belief.

And further the deponent saith not.

Sworn and subscribed before me.

The day of A. D. 19.....

(SEAL) Forest Fire Warden

..... County.

.....
(Signature of deponent)

.....
(Address)

PLAN OF FOREST PROTECTIVE ORGANIZATION

The time has come for much greater efficiency in our forest fire organization. The number and size of forest fires must be **greatly** reduced and our organization put upon a really efficient basis. Our responsibility has increased. Results must be commensurate with the money expended. The forest area of the State is covered by an observation system that is unsurpassed in the United States. Fire fighting tools are being supplied. Needed telephone lines are being erected.

The remaining unit of the organization to be strengthened is the personnel. The following plan has been devised to bring this branch of the service up to a standard that will make it the best of its kind in the country.

Patrol as formerly used is abolished since it has proved to be in most instances inefficient and costly. A study of patrol service will prove this clearly. Instead we have provided a plan of organization, that will insure prompt detection and extinction of fires, inspection and elimination of hazards, fixed responsibility, pay commensurate with service performed, and public education.

Pennsylvania is divided into 24 forest districts, each in charge of a District Forester. As soon as a forest fire occurs the District Forester should be notified as well as the nearest warden. Each district is divided by the District Forester into several sub-divisions, depending upon the size of the District, the nature of the country and the likelihood of fires occurring. In general, the sub-divisions should contain from 50,000 to 150,000 acres of forest land, and will be in charge of an Inspector. The Inspector may be the Forester's Assistant, a State Forest Ranger, or a specially detailed fire warden, who will be responsible to the District Forester for the satisfactory protection of the area.

All recommendations for appointments will be made by the District Forester.

Inspectors

The position of Inspector meets a long felt need for a man who will have active and detailed supervision over a comparatively limited area, make inspections of hazards, make investigations of fires, and have a constant check on the work of the Towermen, Fire Bosses and Wardens.

The Inspector will be the right-hand man of the District Forester in the area allotted to him, and will be in immediate charge of the

fire situation in that territory. He must be capable of making a good impression on the people with whom he comes in contact, honest, hard-working, and impartial. He must be a good organizer, and fire-fighter, and must be capable of making investigations into the causes of fires. He must have some means of conveyance of his own, a horse, automobile, or motorcycle, and should have telephone communication. His activities will in general be confined to private land, except where a State Forest Ranger is detailed for this duty. Preference shall be given in appointments to the best of the present Wardens if suited for the work or if they can serve. He is not a patrolman and shall not be used for that purpose.

DUTIES:—His duties will be to

A—Inspect:—

1. All Sawmills.
2. Railroads.
3. Roads.
4. Other hazardous conditions.

B—See to it that the fire organization is in order at all times to meet any emergency, report to District Forester all indications of inefficiency, and make recommendations for improvement of the organization.

C—Have direct charge of the Fire Wardens in the area assigned to him and to keep them alive to the need for prompt action when their services are needed.

D—Keep in touch with the towermen.

E—Take charge of any fire on which he is needed, especially in case the Warden immediately in charge needs additional help.

F—Investigate all fires in his territory.

G—Check up on all fire fighting equipment in the hands of Fire Bosses, its use and condition.

H—Visit schools.

I—Put up posters.

J—Make a semi-monthly report to the District Forester on Form 34 setting forth his

1. Activities for the period.
2. Recommendations for the betterment of the organization.

COMPENSATION:—He will be paid by the day or hour and will be paid for reasonable expenses incurred in his assigned work.

Towermen

A Towerman shall be in charge of his tower and shall be responsible for its condition. He must be reliable, energetic, have good eyesight, and must be capable of reading and understanding maps. He must know his region thoroughly. He must have knowledge of the general behavior of fires and must be capable of exercising good judgment in the reporting of them. He must be courteous and must be able to talk intelligently about the protective organization in the territory under his observation. He must be neat. Rangers shall **not** be used regularly as towermen. The Towerman must be a Forest Fire Warden and present Wardens who are satisfactory must be given preference in appointment.

DUTIES:—The Towerman shall be responsible for the prompt detection and reporting of all fires that occur on the area under his observation and his duties will be to

A—Report all fires to the Fire Warden nearest the scene of the fire giving the

1. Location and extent as accurately as possible.
2. Direction the fire is burning.
3. Approximate number of men necessary to promptly extinguish it.
4. Apparent cause.

B—Keep the District Forester and Inspector informed as to the progress of all fires and report the need of additional help.

C—Keep the telephone line to the tower in repair.

D—Maintain everything in and around the cabin and tower in a neat and cleanly condition.

E—Do such other work as may be assigned to him during wet weather.

F—Make a **daily** report by telephone to the District Forester during dangerous seasons.

G—Make a semi-monthly report in **duplicate** to the District Forester on Form 36.

COMPENSATION:—He shall be paid by the day or hour for the fire season and shall be expected to furnish his own sustenance and bed clothing. The Department will provide a stove, also fuel where it can not be cut locally by the Towerman.

Fire Bosses

Fire Bosses and their crews will constitute the mainstays of the extinction forces.

The Fire Bosses shall be the best Fire Wardens situated in the most advantageous places for the prompt extinction of fires and should be men who are comparatively independent, such as farmers, storekeepers, etc. Most State Forest Rangers may be detailed for this duty. A fire Boss must be honest, reliable, energetic, a good fire fighter, and organizer. He **must** have a telephone either in his home or one close by that is available for his use at all times. He must appreciate the value of minutes in fire extinction. He **shall not** be used for patrol duty.

DUTIES:—The duties of a Fire Boss will be to

A—Organize and maintain an efficient crew of fire fighters that will be willing to answer a fire call at all times or, if necessary, several crews.

B—Remain at his station during all periods when there is danger of fires occurring.

C—Respond to all fire calls promptly.

D—Have charge of the crew at the fire.

E—Have charge of the fire in the absence of the Inspector and to promptly and efficiently extinguish it.

F—Report on Form 15 all fires he helps to extinguish.

G—Render a correct statement of the expenses in connection with the extinction of fires.

H—Use properly and keep in good condition all fire fighting tools placed in his care.

I—Investigate, under the direction of the Inspector, the causes of the fires he extinguishes.

J—Keep in touch with the Inspector and call upon him or upon the Towerman for assistance.

K—Submit to the District Forester and the Inspector a list of his crew as soon as it is organized.

By having the Fire Boss submit the names of the members of his crew a complete record of personnel is had and a check provided for the District Forester in auditing the fire bills.

Fire Crews

Fire crews shall be made up of reliable men who are good fire fighters and are interested in the prevention and extinction of fires.

Small regular crews (4 to 8 men) can be better trained, organized, equipped, and transported than larger ones. The monetary inducement to join a crew will be the higher wage rate than is to be paid to men not members of crews.

DUTIES:—They shall be willing to go to a fire at any time they are called by the Fire Bosses. The crew is under command of the Fire Boss, and is responsible for the prompt and efficient extinction of all fires.

COMPENSATION:—Regular crews shall be paid a rate higher than the ordinary untrained fire fighters.

Patrolmen

Patrolmen **shall not** be employed except in case of emergency as to time and hazard and only when authorized by the Chief Forest Fire Warden. Their qualifications are the same as those of Fire Bosses.

DUTIES:—A Patrolman's duties shall be specific and be assigned to him by the District Forester. He shall be under the immediate supervision of the Inspector.

COMPENSATION:—He shall be paid an hourly wage for the time actually employed.

Wardens

They will constitute the reserve force of the organization and may be called upon at any time to assist in the extinction of fires. They will be directly under the supervision of the Inspectors. Everything possible must be done to keep up the morale of this volunteer force but by a proper development of the organization now planned the less desirable of the present Wardens can be dropped.

The carrying out of the above plan of organization will enable the District Forester to keep in direct touch with what is going on in his district and will relieve him of many of the minor details of the work. However, with a more extensive system much better results are required and his responsibility thereby is increased.

Rangers may be used as Inspectors or Fire Bosses according to the best results to be obtained.

Appointment of Inspectors, Towermen, Fire Bosses, and Patrolmen where authorized, will be made thru the District Foresters. A Form 31 (notice of Appointment of Patrolmen and Towermen) will be filled

out for **each** man. In case of the appointment of Inspectors and Fire Bosses, the title should be written on the line after the words "Patrolman or Towerman." In the case of Towerman the name of the tower he is to man should be written on the same line.

Towermen will submit reports in **duplicate** semi-monthly (1st to 15th and 16th to 31st) to the District Forester on Form 36 (Towerman's Report.)

Inspectors will make out Daily Report sheets (Form 80) and submit them semi-monthly together with "Inspector's Report" Form 34, to the District Forester. The District Forester will retain the sheets from Form 80 but will forward the original copy, Inspector's Report (Form 34) to the Harrisburg Office.

For the information of the U. S. Forest Service a monthly record of the amount of time spent by all of our men on elimination of forest fire hazards and what they do will be kept. Inspectors, Patrolman, and other should be instructed to enter this data separately on their reports.

Twice a month the Forester will submit a statement of the amount due each Inspector and Towerman for the preceding half-month's services, together with a distribution sheet (Form 82) and the original Towerman's and Inspector's Reports for the half month, (Forms 36 and 34).

EQUIPMENT:—It is the Department's plan to place a supply of forest fire fighting tools in the hands of Rangers, Inspectors, Fire Bosses and some forest fire wardens in key positions. This is being done as quickly as the money available will allow. A start has been made, however, and if tools have been supplied to you please read these instructions carefully.

Instructions As To Care of Tools

When you received the tools you signed a receipt for them (your record may be kept on page 48 of this Manual). You are responsible for their safe keeping. Be sure to keep track of them at a fire and see that they are all returned to you promptly after each fire is out.

The best plan is to have an understanding that each crew member looks after certain tools.

Have a place for the tools and each one in place.

Hang them up—do not lay them on the floor. They will rust and become lost quickly when just "lying around."

Inform your crew and your family where they are.
 Keep them clean, dry, and sharp.
 Keep the torches filled and see that you have plenty of extra wicking on hand.
 Do not use the State's tools for work in the garden on the wood pile or in camping. If you do tools might as well not be furnished for when the emergency comes they will be dull, broken, rusty, clogged and lost.
 See that all tools are marked as property of this Department.
 In case any tools are broken, lost or are unserviceable, immediately notify the District Forester or Inspector so that they may be replaced before need for them again arises.
 Keep the axe handles securely in the axes.
 After a fire check up on the tools.
 Don't lift or carry the spray tank by the hose. Use the handle or strap.
 Keep canteens and canvas buckets dry when not in use.
 The canvas bucket must become thoroughly wet before it will hold water. The buckets are used to carry water for use in the spray tanks.
 It is a good plan to keep axes and saws covered with a thin coating of lard. Oil the catch on the Rich Tool to keep the movable parts in order.
 New handles will be furnished for broken ones when necessary.
 If you have any questions to ask about the tools write the District Forester or call Inspector and tell him.
 Right Now, before you forget it, see that the tools are all ready for duty.

FIRE WARDEN'S RECORD OF TOOLS

		19.....
	Place	Date
Today I received the following forest fire fighting tools from the Department of Forests and Waters.		
		Number
Double Bitted axes		
Hand axes		
Canteens		
Canvas buckets		
Torches		
Wicking		
Spray tanks		
Rich fire tools		
		Fire Warden.

The State Forests of Pennsylvania

By

R. Y. STUART

Secretary, Pennsylvania Department of Forests and Waters

BULLETIN 37

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March, 1925

*The
State
Forests
of
Pennsylvania*



CREATION OF STATE FORESTS

The State of Pennsylvania made her first purchase of forest land in 1898. She had awakened to the need of State leadership in the proper management of forest areas. For generations the Keystone State had been a leader in wood production, but with the wholesale destruction of her forests she was slipping deeper into dependence upon outside sources for wood supplies and was accumulating millions of acres of idle land. In every forest region of the State one could see the havoc of unrestrained lumbering, and the ravages of forest fires. The warning of Dr. Joseph T. Rothrock, Father of Pennsylvania Forestry: "Study the problem from what

point we may, the close connection between human prosperity and forests appears too plain to be disputed. The utter removal of forests marks the beginning of desolation and the disappearance of man's powers over nature," pictured in a prophetic way the effects of forest devastation. Dr. Rothrock advocated the purchase of forest land by the State not only for the production of wood, but also to control floods, to make available to the public health-giving environments, and to assure outdoor recreation to all citizens of the State. On this broad basis the State Forests were created and in accordance with its sound principles they are being administered today.

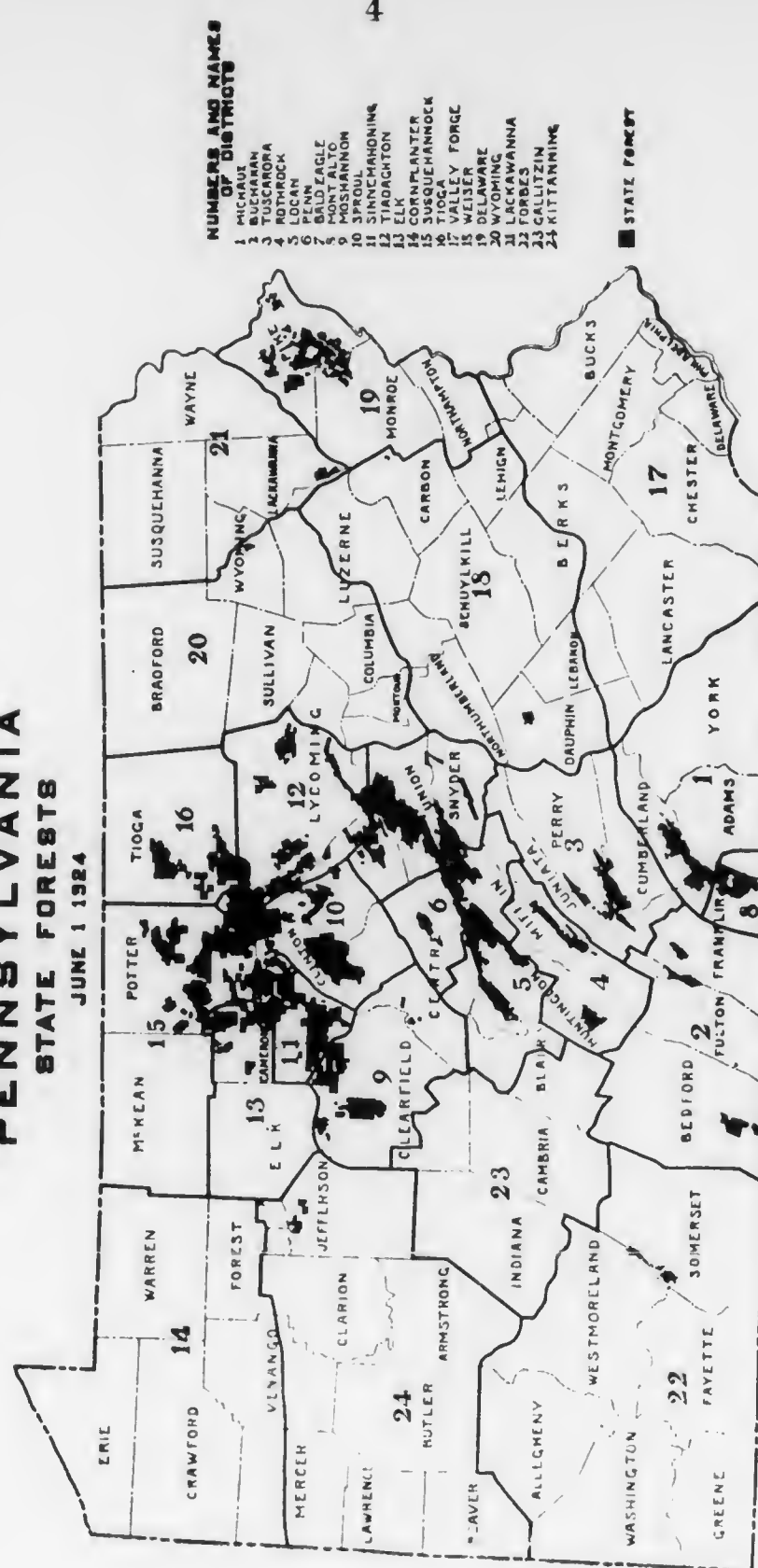
GROWTH OF THE STATE FORESTS

The State Forests have been growing in size ever since the first land was purchased in 1898, when 17,010 acres were acquired. At the end of the third year after purchase work began the State owned 95,140 acres. By the end of the tenth year 750,109 acres had been acquired. Now, after a quarter of a century of acquisition work, the State Forests comprise a total of 1,131,611 acres.

METHOD OF PURCHASE

The State Forest Commission, comprised of four citizens appointed by the Governor in addition to the Secretary of Forests and Waters, is the body authorized by the Legislature to purchase State Forest Land. The policy consistently followed by the Commission in these purchases is to give preference in purchase to those forest lands not now productive, or practically unproductive, which can be made to yield wood products. The intent of the Legislature, as carried out by the Commission, is to restore idle forest lands to production through State ownership and management. The maximum price which can be paid under the law by the Commission is \$10.00 per acre. So consistently has the Commission adhered to its policy of giving preference in purchasing to poorly forested lands, that the average price paid for lands so far acquired has been only \$2.26 per acre. It has been clearly demonstrated, over a period of 26 years, that land purchases by this Commission afford the necessary safeguards to the public against excessive prices or unethical practices.

PENNSYLVANIA STATE FORESTS JUNE 1 1924



LOCATION OF THE STATE FORESTS

These State-owned tracts are located chiefly in the mountainous parts of the State, where most of the land primarily adapted to the raising of successive crops of forest trees is found. The accompanying map shows in black the location of the State Forests, and the following table gives the acreage of State Forest land in each of the 29 counties in which State Forests are located:

COUNTY	AREA (acres)
Adams	20,887
Bedford	10,756
Cameron	83,055
Carbon	436
Centre	79,388
Clearfield	65,069
Clinton	143,829
Cumberland	21,720
Dauphin	3,808
Elk	22,767
Franklin	34,678
Fulton	6,396
Huntingdon	62,431
Jefferson	5,681
Juniata	3,534
Lackawanna	5,275
Luzerne	11
Lycoming	104,635
Mifflin	50,382
Monroe	6,400
Perry	29,468
Pike	58,198

COUNTY	AREA (acres)
Potter	158,785
Snyder	20,320
Somerset	6,198
Tioga	67,069
Union	54,193
Westmoreland	5,065
Wyoming	1,177
Total	1,131,611

WHO HANDLES THE STATE FORESTS?

The State Forests are administered by the Department of Forests and Waters. To give efficient and prompt service to the public, the State has been divided into 24 forest districts each of which is in charge of a technically trained District Forester assisted by Assistant Foresters and Forest Rangers. There are now (Jan. 1, 1925) 49 Foresters and 63 Forest Rangers in the State Forest Service, exclusive of the temporary employes required for State-wide forest protection. There are 3,000 Forest Fire Wardens throughout the State who assist in the prevention, detection, and suppression of forest fire. All officers of the Department are required to render to the public the highest service of which they are capable.

THE STATE FORESTS BELONG TO THE PEOPLE

The State Forests of Pennsylvania are the peoples' property. They are available at all times for wise use. No class of forest users is favored. Every one is treated alike. There are no trespass signs on these lands, but on every State Forest appear large signs bearing the words "You are welcome on the State Forests." These tracts are administered in such a way that they bring the greatest benefits to all citizens of the State. All that is required of State Forest users is that the forests and the equipment thereon be used wisely and not abused. Safeguards are provided against injury to the forests in all sales of forest products and in all permits that are granted for special forest use. The aim of the Department of Forests and Waters is to so handle the State Forests that they will produce a continuous crop of forest products and bring a full measure of other benefits to all the citizens of the State.

THE STATE FORESTS ARE NOW ACCESSIBLE

When the forest lands were acquired by the

State, most of them were so remote and inaccessible that man seldom visited them. Under State administration more than 1,200 miles of roads and approximately 2,500 miles of trails have been developed. The State Forests have been made accessible for administration, protection and use. Their boundary lines have been cleared, painted, posted, and otherwise marked so that their location is definitely fixed. Direction signs are generally placed as an aid to traveller and visitor to reach any portion of the forests desired. There is conveyed in every practicable way to the State Forest visitor the spirit of welcome.

The first step necessary in a sound forest program is the protection of the forest from fire. As the forest is every man's friend, so forest fire—the greatest enemy of the forest—is every man's enemy. Few and futile attempts were made to control forest fires prior to the time the State began to acquire forest land. Immediately after land purchase work was started by the State, active steps were taken to give proper protection not only against fires but also against insects, fungi, and other destructive pests.



More Than 1,200 Miles of Roads Have Been Built on the State Forests. They are Now Accessible for Administration, Protection, and Use.



About 2,500 Miles of Trails Have Been Developed on the State Forests. Even the Most Remote Areas Can Now be Reached.

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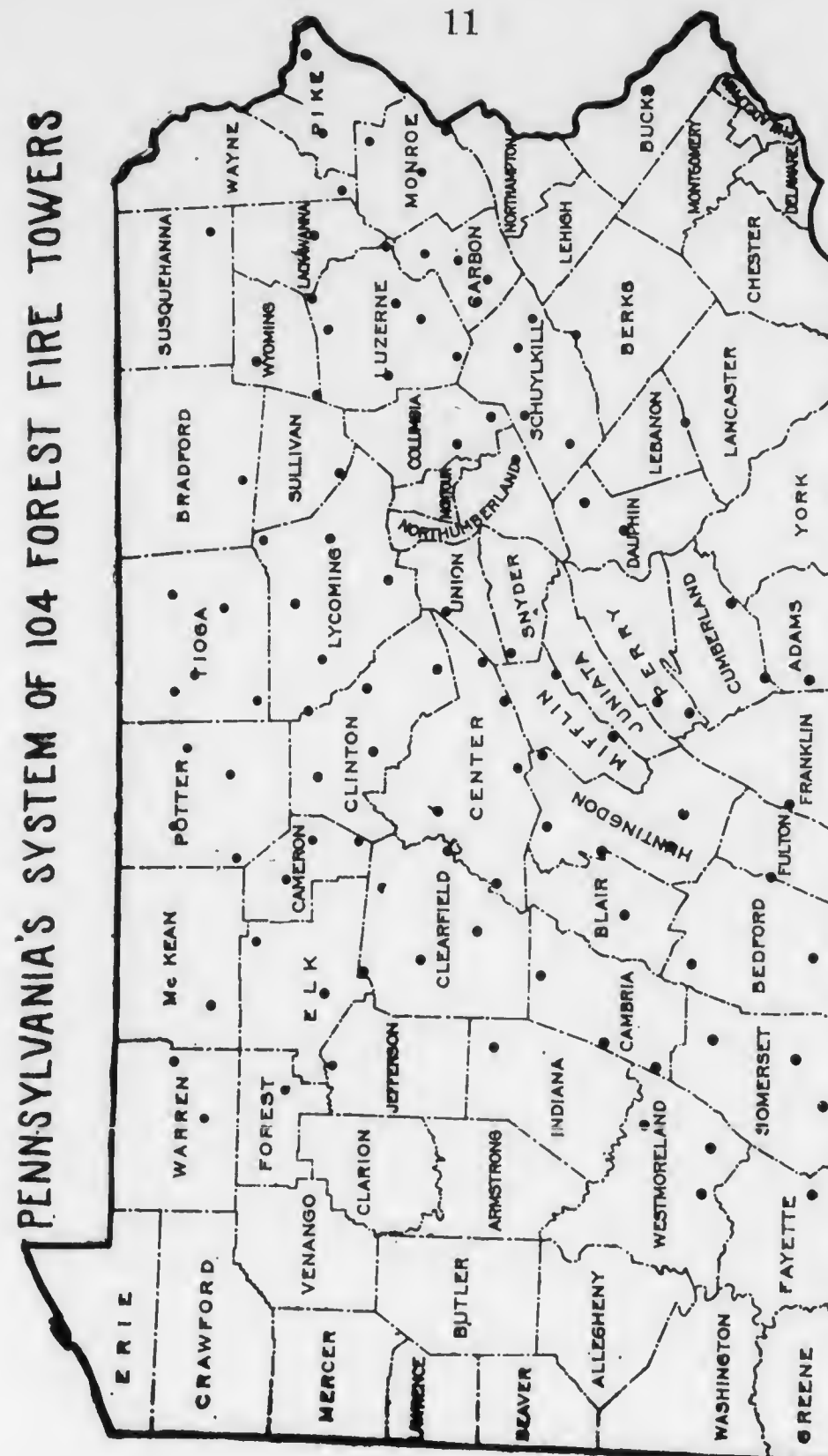


About 2,500 Miles of Trails Have Been Developed on the State Forests. Even the Most Remote Areas Can Now be Reached.

WHAT FOREST PROTECTION IS DOING

In 1915 the Bureau of Forest Protection was established in the Department for the purpose of extending forest protection to all forest lands in the State. Since then there has been developed an organization that is now getting excellent results and making a successful fight against forest fire. There has been put into effect for the entire State a comprehensive forest protection plan. The organization that is now (Jan. 1, 1925) combatting forest fires comprises 49 Foresters, 63 Forest Rangers, and 3,000 Forest Fire Wardens. Permanent improvements have been made and modern equipment installed to cope with forest fire problems, and all fire fighting crews are equipped with first-class tools. More than 100 forest fire observation towers constructed at a total cost of \$100,000, have been erected in all parts of the State. They are indispensable in detecting and reporting forest fires. These fire towers are connected with the headquarters of District Foresters and Forest Rangers by 744 miles of telephone lines erected at a total cost of \$92,500. The permanent improvements and required equipment are a big factor in helping the fire fighting organization to do its work efficiently.

PENNSYLVANIA'S SYSTEM OF 104 FOREST FIRE TOWERS





More than 100 Forest Fire Observation Towers Have Been Erected in all Parts of Pennsylvania.

Twenty-five years ago no organized attempt was made to control forest fires in Pennsylvania. As late as 1913 less than 50 per cent of the forest fires in Pennsylvania were reported, while in 1917, only two years after the Bureau of Forest Protection was established, about 75 per cent were reported. Now (1924) 98 per cent of all the fires that occur in the State are reported promptly to forest officers, and thoroughly organized and fully equipped fire fighting crews are immediately dispatched to extinguish them.

In 1923, 3,539 forest fires, with an average size of 105 acres, were reported and extinguished by Pennsylvania's forest fire fighting organization. If these fires had been of the same average size (161 acres) as those of the ten-year period 1913-1923, and had caused the same average damage (\$2.19) per acre, there would have been burned over in 1923 an area of 569,779 acres with a total damage of \$1,247,816.01, or \$453,088.64 more than the fires of 1923 actually did incur; or if they had been of the same average size as those of the year 1913, a comparable year seasonally, there would have been burned over 1,458,068 acres with a damage of \$3,076,523.48, whereas their



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actual damage was only \$794,727.37. Either way it is considered, the improved fire fighting organization of the Department during 1923 effected a saving of from \$450,000 to more than \$2,280,000.

The smallest area of forest land burned over during any spring since the Department has been keeping records, was this spring (1924) when 903 fires burned over 41,747 acres—an average of only 46 acres per fire. The effectiveness of the State Forest fire fighting organization is reflected in the fact that during the last 5 years there has been burned over annually less than one per cent of the total area of the State Forests. In 1924 only 2,025 acres of State owned forest land was burned. This is only one-tenth of one per cent of the total area of the State forests. If the forest fire organization is properly supported, it will continue to cope successfully with the forest fire problem, for during the 1922 and 1923 fire seasons it met the severest test that it will probably be called upon to meet for many years. Continuous training and constant vigilance are required to keep the forest fire problem within the limits of reasonable safety.

Forest protection is the first essential in replenishing our depleted wood supply. The results of forest protection in Pennsylvania are shown by the fact that more wood is being produced by forest growth than is being destroyed by forest fires. In addition to the material results of forest protection, many intangible benefits are produced. Our water supplies are being safe-guarded, game is more plentiful, fish more abundant, and marvellous spots of sylvan splendor are becoming available to all citizens of the State. All these things are important factors in sustaining the health, insuring the welfare, and promoting the happiness of the citizens of Pennsylvania.

MORE THAN 35 MILLION TREES PLANTED ON STATE FORESTS

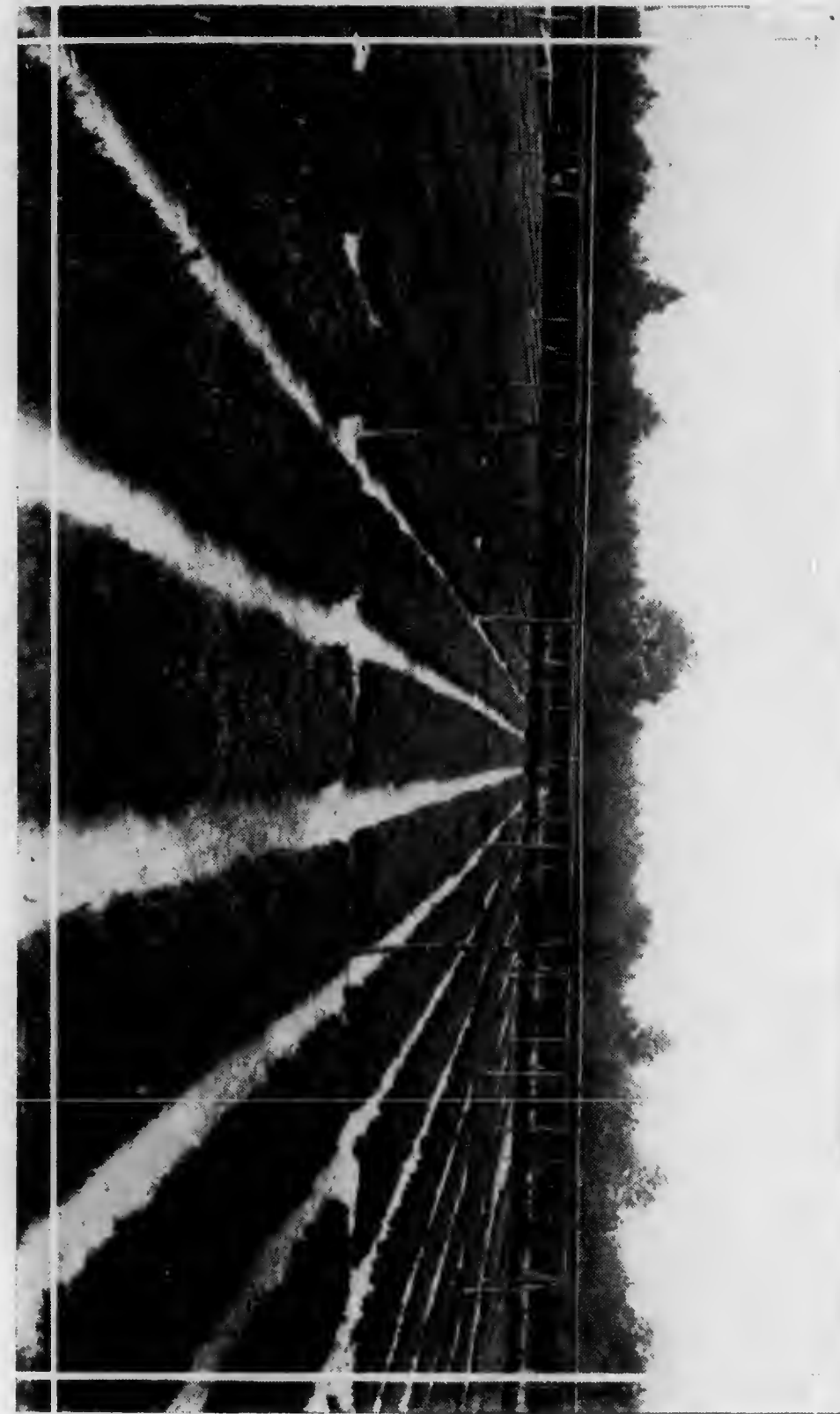
Some of the forest land when purchased was so devoid of tree growth that the planting of a new crop of forest trees was necessary. In order to supply the trees required for planting, a number of nurseries were established. The first was established at Mont Alto in 1900; it now has an annual capacity of 4,000,000 trees. There are two other large forest tree nurseries in the State, one at Clearfield and the other at Greenwood Furnace.

Several smaller nurseries are also operated co-operatively by the Department of Forests and Waters. The total annual output of these nurseries has almost reached the 10 million mark. During the last 25 years 35,331,659 trees have been planted on the State Forests at an average cost of \$9.34 per acre. As a result of this planting there are now growing upon the State Forests approximately 23,500 acres of thrifty plantations of white pine, red pine, white ash, red oak, white oak, black walnut, and many other important forest trees.

PRIVATE OWNERS HAVE PLANTED MORE THAN 32 MILLION TREES

The 23,500 acres of planted trees on the State Forests are doing much more than produce wood. They are instructive object lessons to private owners of forest land. Ever since tree planting work was undertaken on the State Forests, private owners of forest land throughout the State have been observing it, and are becoming impressed with its success. About 15 years ago a considerable demand developed among private owners of forest land for tree planting stock. To satisfy this demand, the Department of Forests and Waters was authorized in 1910 to cooper-

Almost Ten Million Trees are Distributed Annually from the Nurseries Operated by The Pennsylvania Department of Forests and Waters.





More Than 35 Million Forest Trees Have Been Planted on the State Forests of Pennsylvania.

ate with private planters by supplying them with planting stock *at the cost of production*. In 1915, a greater measure of cooperation was authorized by supplying planting stock to private planters *at the cost of packing and transportation* only. The following table gives the number of trees planted on the State Forests by years and the number distributed from the Department nurseries to private forest tree planters in Pennsylvania:

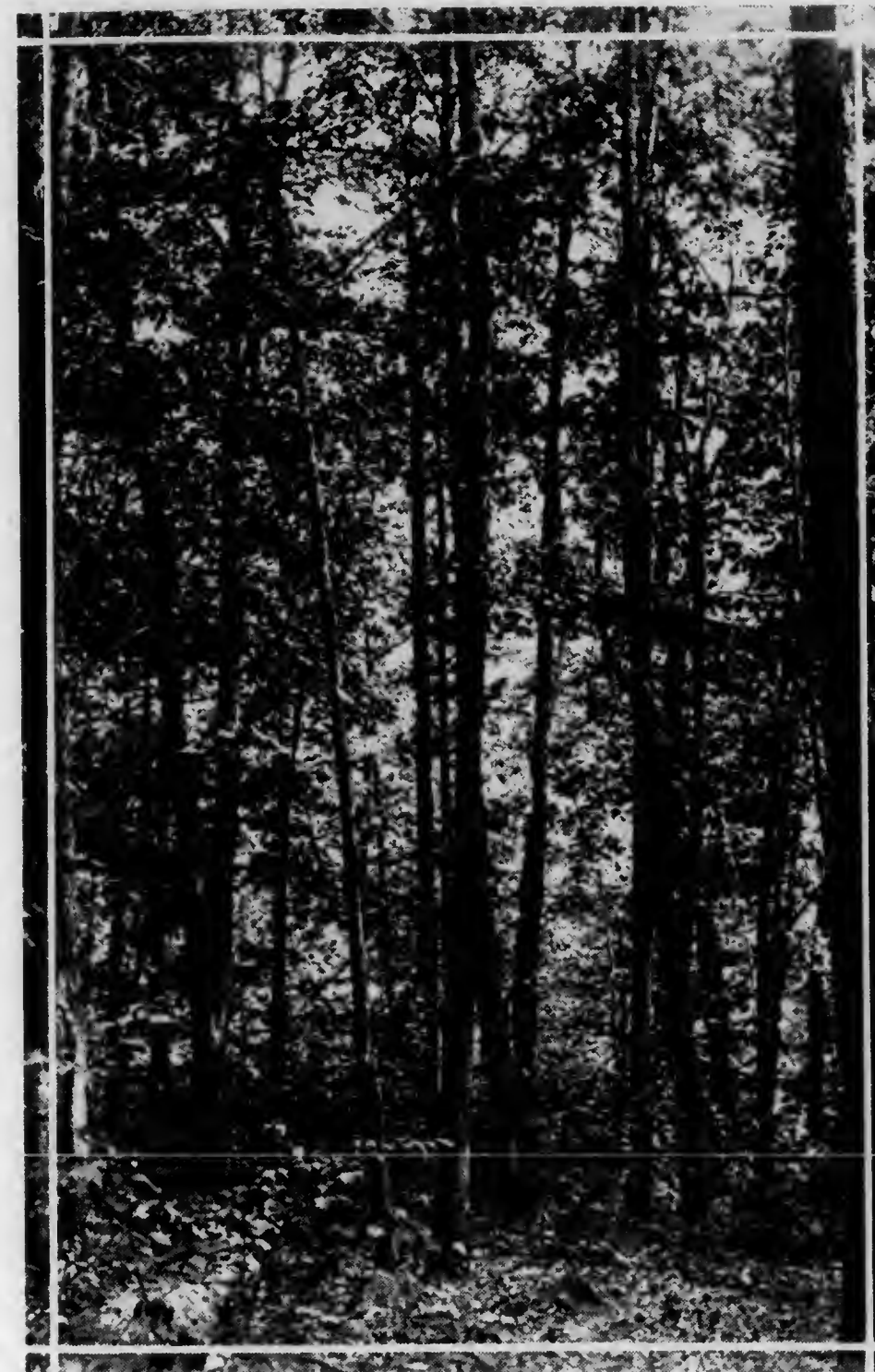
Year	Number of Trees Planted on the State Forests	Number of Trees Supplied Private Planters by the De- partment of Forests and Waters
1899	1,000	-----
1900	1,500	-----
1901	-----	-----
1902	5,000	-----
1903	1,600	-----
1904	7,700	-----
1905	40,000	-----
1906	99,550	-----
1907	36,930	-----
1908	100,628	-----
1909	738,461	-----
1910	1,092,213	66,374
1911	1,663,661	25,360
1912	1,890,404	66,854
1913	3,164,637	47,770
1914	3,393,571	108,685
1915	4,315,436	115,577
1916	5,492,020	1,471,875
1917	3,595,720	1,812,997

Year	Number of Trees Planted on the State Forests	Number of Trees Supplied Private Planters by the De- partment of Forests and Waters
1918	6,033,760	2,186,899
1919	2,132,547	3,139,531
1920	238,298	2,543,374
1921	177,960	3,041,710
1922	133,221	3,670,621
1923	551,462	5,437,817
1924	424,380	8,577,464
Total	35,331,659	32,312,908

Forest tree planting in Pennsylvania is an established practice. It is growing by leaps and bounds. As shown by the foregoing table, only 66,374 trees were set out by private planters in 1910; in 1915, 115,577 trees; and less than a decade later the number had increased to more than eight and one-half million trees. During 1924, 2,081 forest tree planters set out 8,577,464 trees in all parts of the State. Pennsylvania now leads all other states in the number of trees she supplies to private owners of forest land.

GREAT CHANGE HAS TAKEN PLACE

The State's program of forest restoration on State Forests has brought remarkable changes. When these lands were acquired, they were in a devastated condition. Lumber-



Under State Ownership Promising Stands of Thrifty Forest Trees Have Replaced Vast Areas of Unproductive Waste Land.

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men had just completed removing all salable material, and what had been left by them was consumed by destructive forest fires. Vast areas were entirely bare of trees when the State came into possession of them. These lands have been changed under State ownership from barren mountain sides to forest covered slopes. In place of desolation, there are now promising stands of thrifty trees that in time will produce valuable wood products.

STATE FORESTS ARE OBJECT LESSONS IN PRACTICAL FORESTRY

The State Forests are object lessons in practical forestry. They point the way in good forest practice. Upon them can be seen the best methods of handling forest properties and improving forest conditions. There the citizens of the State can learn practical lessons in forest protection, forest tree planting, and forest improvement work. The results upon the State Forests are the best proof of what our forests can do, and demonstrate in the most practical way how forest properties should be handled. One can see there the promise of the forests that are to be.



The 23,500 Acres of Planted Forest Trees on the State Forests of Pennsylvania are Instructive Object Lessons to Private Owners of Forest Land

STATE FORESTS ARE A BUSINESS ENTERPRISE

The State Forests are handled as a business enterprise. In spite of the deplorable conditions that existed on the State Forests at the time they were acquired, a material income has already been derived from them. When the State acquired the land there was little tree growth upon it, and even now most of the trees are still immature, yet a considerable return has already been received. The first receipts from the State Forests were obtained in 1900, when \$1,227.87 were taken in from the sale of forest products. The annual income has been increasing markedly; in 1923 it amounted to \$113,094.34, and in 1924 to \$117,308.20. The total receipts from the State Forests amount to \$595,244.95, of which \$318,055.81 have been deposited in the State School Fund.

A visit to any of the 21 State Forests of Pennsylvania will convince any one of the wisdom of State ownership of forest land. This land, purchased at an average cost of \$2.26 per acre, is now worth \$11.80 per acre. The following table, as of December 31, 1923, gives the total purchase price of the State

Forests, expenditures for administration, development, and improvement, and shows the increased value that has taken place during the last 25 years.

Estimated present value	\$13,349,504.49
Total investment and expenditures,	8,165,224.37
Net gain on investment	\$5,184,280.12
Total purchase price	\$2,559,237.73
Expenditures for administration, development, and improvements,	\$5,605,986.64
Total expenditures	\$8,165,224.37

The foregoing estimate shows that there has been a total net gain of \$5,184,280.12. European experience and numerous studies on the State Forests of Pennsylvania show that a net return of at least \$5.00 per acre per year may be expected from the State Forests when they are restored to full productivity.

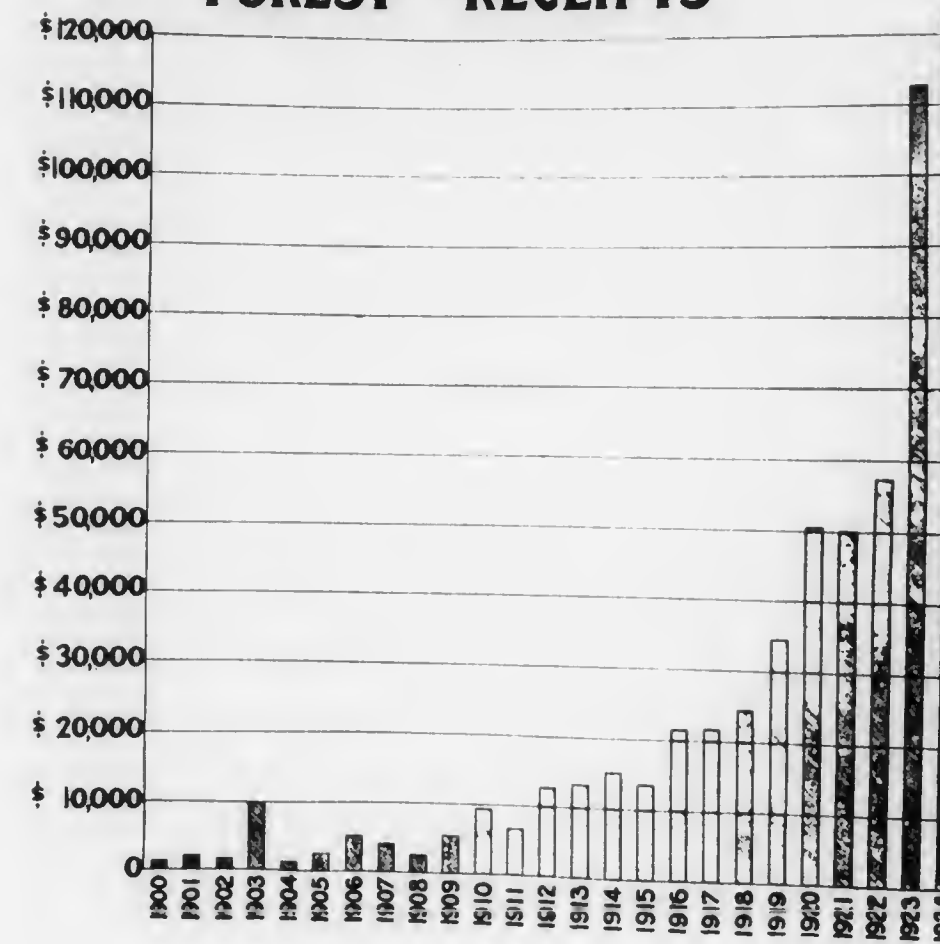


Great Stretches of Devastated Forest Land Were Common in Pennsylvania When the State Began Her Forestry Program.



Thousands of Acres of Idle Forest Land in Pennsylvania Remain in Private Ownership That Should be Included in the State Forests.

PENNSYLVANIA STATE FOREST RECEIPTS



YOU ARE WELCOME ON THE STATE FORESTS

The State Forests are available for all forms of recreation. Within them are 31 public camp grounds, 7 State Forest Parks, 9 State Forest Monuments, and several Scenic Areas, all of which are open for proper use. Some of the camping places are equipped with a fire place, a supply of pure water, comfort stations, garbage containers, tables, and benches, and have a space for tents. Others have been developed for smaller parties and are equipped with an open-front lean-to, fire place, tables, benches, garbage containers, and other necessary camp equipment. All of the camps are supplied with good drinking water and are situated in attractive surroundings. A conservative estimate shows that at least 250,000 people visited these camps during 1924. It is also estimated that last year approximately 65,000 people visited the forest fire observation towers from which some of the finest and most expansive views within the State can be had. Not less than 600,000 people enjoyed the out-of-doors on the State Forests during 1924.

GOOD HUNTING AND FISHING ON THE STATE FORESTS

Legitimate hunting and fishing is encouraged on the State-owned forest land. Many sportsmen consider the State Forests their best hunting grounds, and within them are some of the finest fishing streams of the State. Records kept by District Foresters show that 100,000 hunters and 25,000 fishermen enjoyed the privileges of the State Forests in 1924. About 55% of the deer and 45% of the bear killed in the State during 1924 were shot on State Forests. Without forests there can be no game or fish worthy of the sportsman's skill.

HAVE A CAMP IN THE WOODS

There are now almost 1,300 permanent camps on the State Forests leased by citizens of Pennsylvania at an annual rental ranging from \$7.00 to \$15.00. These camp sites cover in the aggregate 700 acres. In 1924 they brought an income to the State of more than \$10,000.00. It is estimated that not less than 225,000 people used these camps last year, and in years to come the camping facilities on the State Forests will not be surpassed within

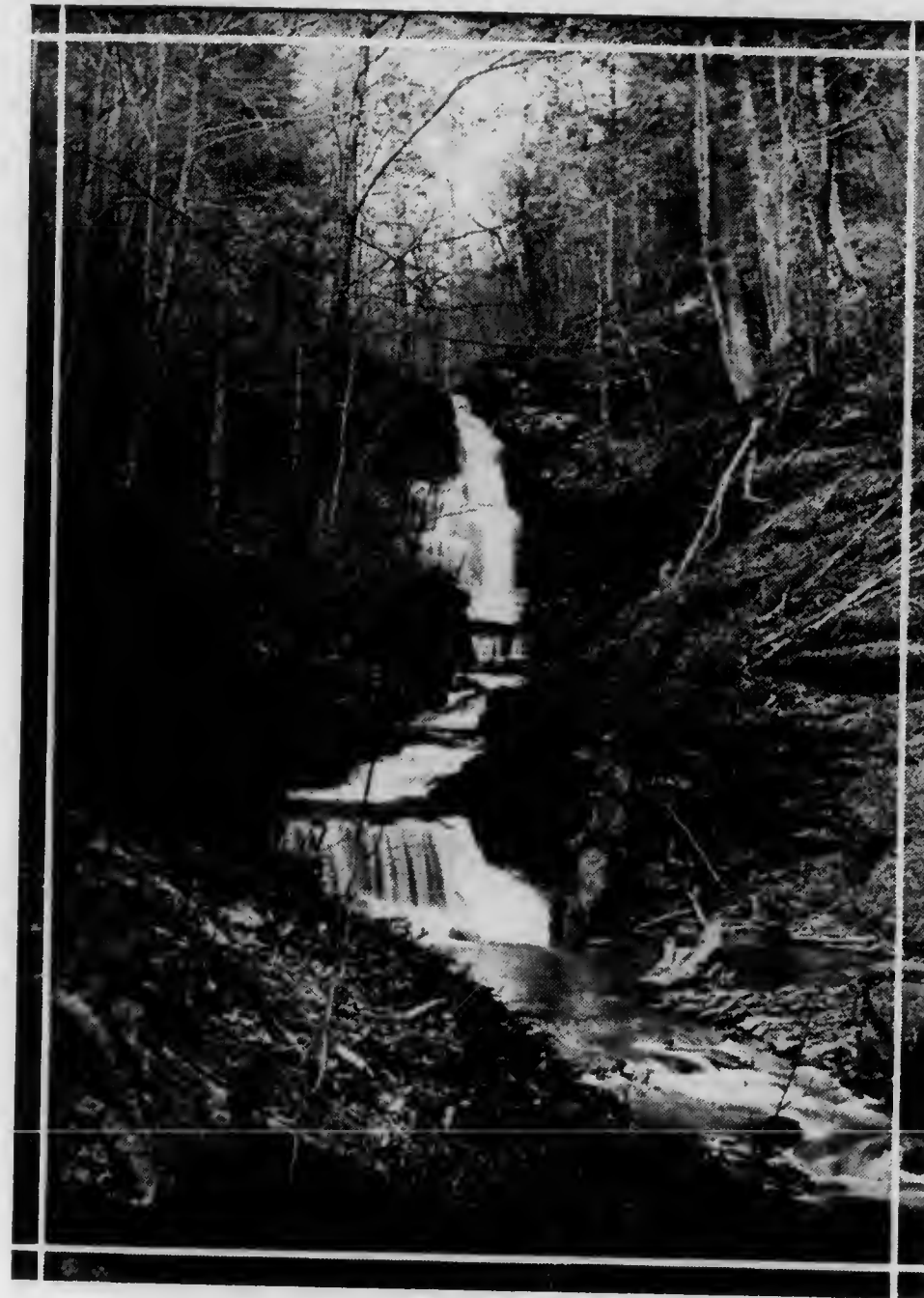
the State. They have become the recreation centers for citizens of every walk in life, particularly for those of restricted means.



Have a Camp in the Woods.
Almost 1,300 Beautiful Sites on the State Forests
Have Been Leased to Citizens of Pennsylvania.

STATE FORESTS SAFEGUARD WATER SUPPLIES

Most of the water supplies of the State flow from forested hills and mountains. Special efforts are made by the Department of Forests and Waters to safeguard and increase the water supplies originating on the State For-



The Best Water Supplies Flow From Well Forested
Hills and Mountains.

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ests. Four municipalities have their impounding basins within the State Forests, and twelve other Pennsylvania municipalities secure their water supply from watersheds having more than 50% of their area on State Forests. Thousands of other people use of the pure water supplies that flow from the



Sixteen Municipalities of Pennsylvania Receive Their Water from Watersheds That Lie Chiefly in the State Forests.

State Forests. There is no better way to insure an adequate supply of potable drinking water for the people of Pennsylvania than to develop and extend the State Forests.

PUBLIC FORESTS A FIXED POLICY

Public ownership of forest land is now a fixed public policy. The Federal Government owns 156,600,000 acres of forest land, and 20 different states own a total of 8,700,000 acres. European experience extending over more than two centuries, the experience of the United States Government since 1891, and that of 20 different states covering more than a quarter of a century, have demonstrated the wisdom of public ownership of forest land.

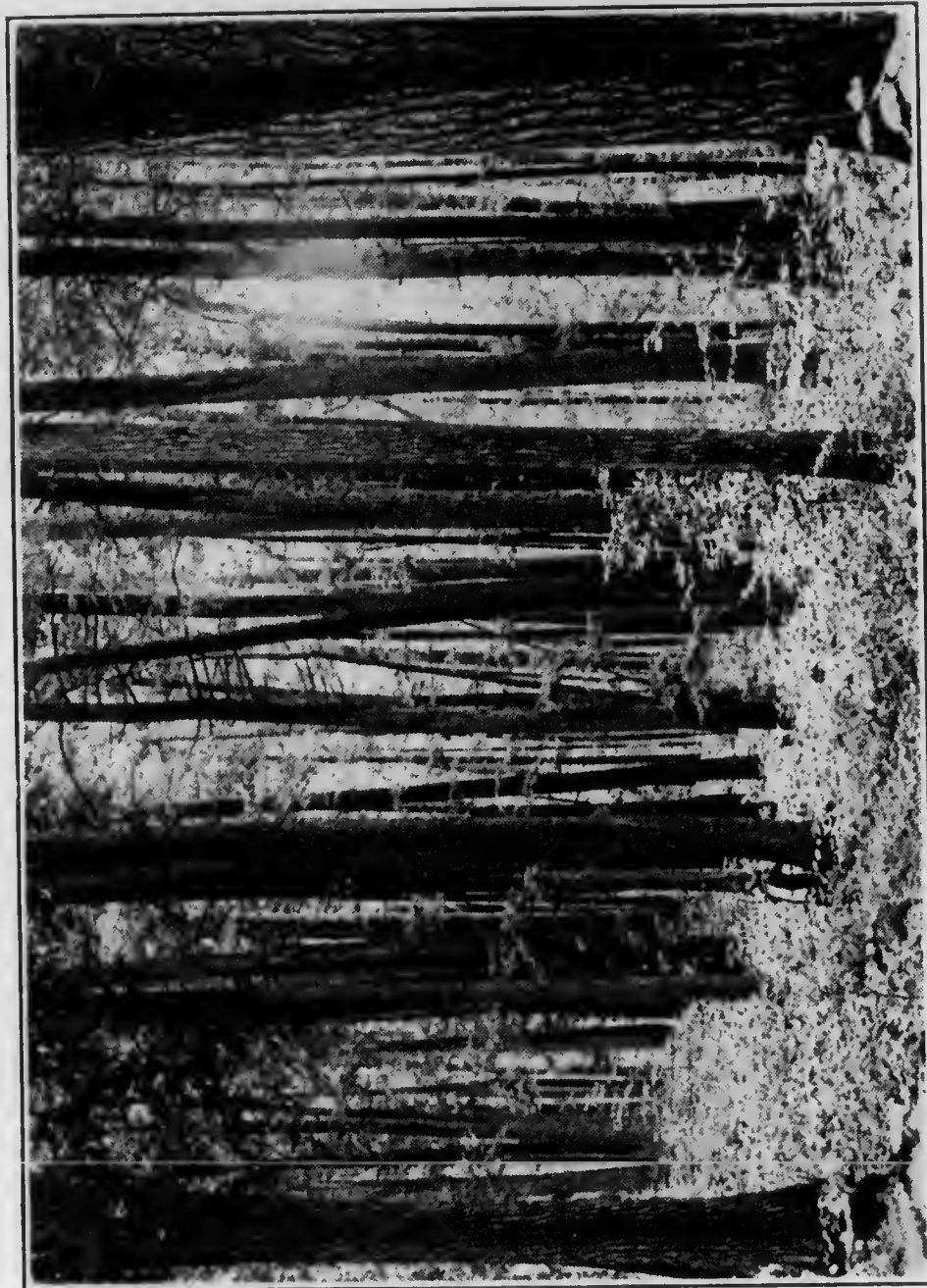
The greatest asset that any State can have is the health and welfare of her people. Carefully managed forests are a big factor in promoting health and securing prosperity. The best way to insure needed timber supplies, public playgrounds, hunting and fishing grounds, and health centers for our people, and to protect our water supplies is to maintain large areas of State-owned forest land in all parts of the State.

STATE FORESTS PROTECT THE PEOPLE

The State Forests of Pennsylvania protect vital interests of her people. Their maintenance and extension is essential to the prosperity of her industries and the welfare of her people. Being publicly owned they are man-

aged to bring the greatest measure of good to the greatest number of people, while most of the privately owned forests are handled for private gain and their owners give little thought to the public welfare.

Future citizens need the protection afforded by State-owned forest land, a heritage that is justly theirs. Our obligations to succeeding generations will not have been met until, through the expansion of State Forests and the proper management of private forest lands, every acre of land in the State best suited to forest growth is made and kept productive.



ORIGINAL FOREST OF PENNSYLVANIA WHITE PINE AND HEMLOCK

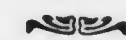
The State Forests of Pennsylvania

By

Joseph S. Illick
State Forester of Pennsylvania



Bulletin 37
(Revised and Enlarged)



Commonwealth of Pennsylvania
Department of Forests and Waters
Charles E. Dorworth, *Secretary*
Joseph S. Illick, *Deputy Secretary*
and State Forester
Harrisburg, Pennsylvania
1930

STATE FOREST COMMISSION

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MARY FLINN LAWRENCE
N. P. WHEELER, JR.
ASHIER ODENWELDER, JR.

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ALFRED E. RUPP, *Forest Management*
IRVIN W. GLEASON, *Lands*
R. LYNN EMERICK, *Research and Information*
CHARLES R. MEEK, *Forest Extension*
JACOB M. HOFFMAN, *Forest Parks*
W. ERDMANN MONTGOMERY, *Accounts and Maintenance*

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THE STATE FORESTS OF PENNSYLVANIA

It is particularly appropriate that the Commonwealth of Pennsylvania should own forest land, for the word Pennsylvania means "Penn's Woods." The aggregate area of forest land now (January 1, 1930) owned by the Commonwealth and administered by the Department of Forests and Waters totals 1,290,692 acres.

Pennsylvania owns and administers these vast holdings of forest land for the benefit of her people. First of all, these lands are handled so that the people and industries of the Commonwealth may be assured an adequate and continuous wood supply. The State forests are also administered with the idea of protecting watersheds, safeguarding water supplies, regulating stream flow, promoting health, providing outdoor recreation, and conserving the natural beauty of the forested regions of our great Commonwealth.

When the first settlers came to Penn's Woods, the entire State, with the exception of a few natural meadows in the lowlands, and scattered rocky areas in the highlands, was covered with a dense forest growth. From that day to this, Pennsylvania's wonderful forest heritage has

contributed much to the prosperity and happiness of her people. The original forest of Pennsylvania was an enormous wood reservoir. It covered approximately 28,650,000 acres, and contained great areas of the choicest timber that ever grew in America. In the early days there seemed to be no end to these woods. Big trees grew in apparently limitless stands. It did not seem to be possible that such forests could ever disappear. They supplied the raw material for a great lumber industry. By 1860 Pennsylvania led all the other States in lumber production. For several decades lumbering surpassed all other industries in the State. As late as 1890 the forests and the sawmills of the Keystone State produced as much wood as was used within the Commonwealth. Thereafter, Pennsylvania's forests began to dwindle rapidly. Before 1900 they failed to meet the State's demands for timber, and she became a lumber-importing State. The very thing which, a few decades earlier, had seemed impossible, had come to pass, namely, Pennsylvania's great forests were mostly a memory.

HOW THE STATE FORESTS WERE CREATED

The seriousness of this situation was not at first fully understood. In time the people began to comprehend the fact that the Commonwealth's forests were rapidly being depleted and that no effort was being made to renew and perpetuate them. Out of this situation arose two major problems: How should the State meet her future wood needs, and how should

she solve her idle land problem? The latter was the more pressing problem. Wherever lumbering had been completed, vast areas of land were left completely denuded and unproductive. Whatever trees were left by the lumbermen, together with such little trees as tried to spring up in the wake of lumbering, were consumed by repeated forest fires.

A few men and women of vision set themselves to the task of investigating these important problems. Study after study was made, and in each case the investigators reached the same conclusion, namely, that the only practicable way to get these barren areas back to production was to bring them under State ownership. After much discussion and considerable delay, the plan for State ownership was agreed to and recommended.

Some one has said that every enduring human institution is the lengthening shadow of a great man. Many of the early achievements in Pennsylvania forestry can be traced back directly to the late Dr. Joseph T. Rothrock, who is affectionately known as the "Father of Pennsylvania Forestry." Years before a single acre of forest land was acquired by the State, Dr. Rothrock had started a movement that called attention to the serious condition of the forests within this Commonwealth. As early as 1877 he began his historic Michaux lectures on forestry in Philadelphia. Nine years later, in 1886, the Pennsylvania Forestry Association was organized. At once a publication was started to create interest in the forest. This publication, a bi-

monthly periodical called *Forest Leaves*, has been issued continuously since that date, and is the oldest forestry periodical in America.

Two years after the Pennsylvania Forestry Association was formed, or in 1888, Governor James A. Beaver appointed a commission to study the forest conditions in the Commonwealth. In 1889 this commission presented its report to the General Assembly. Four years later, in 1893, Governor Robert E. Pattison appointed a second commission to investigate the forest situation. Its studies covered the entire Commonwealth and brought out in a most convincing way the deplorable situation existing in the forests of Pennsylvania. The conclusions of this commission were embodied in the comprehensive forestry report of 1895. This report was very largely the work of Dr. Rothrock, who later became the State's first Commissioner of Forestry.

Within two years after the 1895 forestry report was issued, the General Assembly passed an act authorizing the purchase of forest lands by the Commonwealth. The General Assembly of 1897 was friendly to the plan of State ownership of forest lands, and authorized the purchase of 40,000 acres at the headwaters of the three main rivers of the Commonwealth. On June 13, 1898, Pennsylvania purchased her first forest land. During that first year (1898), 17,010 acres of land were purchased. During the first five years of purchase work, the Commonwealth acquired 314,572 acres of forest land. In ten years the area of State forest land had

grown to 750,109 acres. By January 1, 1930, the State forests contained 1,290,692 acres. During the next two years approximately 275,000 acres will be added to the State-owned forest domain. By that time the total area of State forests in Pennsylvania will be in excess of 1,500,000 acres.

WHERE THE STATE FORESTS ARE LOCATED

The State forests of Pennsylvania are distributed through 32 counties and are located chiefly in the mountainous parts of the Commonwealth, where the land is fit for little else than the production of successive crops of forest trees. Most of the forest land now owned by the Commonwealth lies within a belt that extends entirely across Pennsylvania, from Potter and Tioga Counties on the north to Fulton and Adams Counties on the Mason and Dixon line. Here and there outside of this belt are detached areas of State forest land, a number of which are of considerable size. The largest of these separate forest areas is in the Pocono region in Pike and Monroe Counties. Here are situated more than 60,000 acres of State forest. Another detached area, located in Somerset and Westmoreland Counties, contains almost 16,000 acres. Bedford County has slightly more than 15,000 acres. Smaller detached units of State forest are found in several other counties. The outline map on page 13 shows in black the location of all Pennsylvania State forests as of January 1, 1930.

The following table gives the area of the State forests by counties as of January 1, 1928; the

area added by counties during the two years from January 1, 1928, to January 1, 1930; and the total area by counties as of January 1, 1930:

AREA OF STATE FORESTS OF PENNSYLVANIA
BY COUNTIES

County	Area Jan. 1, 1928 (Acres)	Area added 1928-1929 (Acres)	Total Area Jan. 1, 1930 (Acres)
Adams	20,887	.....	20,887
Bedford	10,756	3,487	14,243
Cambria	.....	15	15
Cameron	83,055	12,157	95,212
Carbon	436	170	606
Centre	79,388	14,240	93,628
Clarion	.....	1	1
Clearfield	65,069	3,934	69,003
Clinton	144,341	35,075	179,416
Cumberland	21,720	1,374	23,094
Dauphin	3,808	.....	3,808
Elk	22,767	13,107	35,874
Forest	.....	2	2
Franklin	34,881	1,293	36,174
Fulton	6,396	3,074	9,470
Huntingdon	62,431	460	62,891
Jefferson	5,681	3,332	9,013
Juniata	3,534	.....	3,534
Lackawanna	5,275	.....	5,275
Lycoming	104,730	1,579	106,309
Luzerne	11	.....	11
Mifflin	50,840	1,096	51,936
Monroe	6,400	.....	6,400
Perry	29,468	1,720	31,188
Pike	58,370	.....	58,370
Potter	158,785	50,253	209,038
Snyder	20,320	2,429	22,749
Somerset	6,150	4,697	10,847
Tioga	67,069	3,942	71,011
Union	54,193	204	54,397
Westmoreland	5,113	.....	5,113
Wyoming	1,177	.....	1,177
Totals	1,133,051	157,641	1,290,692

PENNSYLVANIA
STATE FORESTS
JANUARY 1, 1930



HOW THE STATE FORESTS HAVE GROWN

On June 13, 1898, Pennsylvania purchased her very first acre of forest land. During that first year 17,010 acres were purchased at tax sales. This land did not come into the possession of the Commonwealth until 1900, after the two-year tax redemption period had passed. During the next three years 120,528 acres were added. In the fifth year (1902), 175,035 acres were purchased. This is the largest area of forest land acquired in any one year during the entire history of State forest land purchases in Pennsylvania. The second largest area added in one year was acquired in 1904, when 142,243 acres were secured. A quarter of a century later, in 1929, the Commonwealth acquired the third largest area, with the purchase of 118,001 acres of forest land.

The following table shows the growth by years in the acreage of the Pennsylvania State forests from 1898 to 1929:

YEAR	TOTAL AREA ACQUIRED (Acres)
1898	17,010
1899	.....
1900	78,131
1901	44,397
1902	175,035
1903	87,985
1904	142,243
1905	86,625
1906	67,848
1907	50,835
1908	75,231
1909	88,301
1910	17,184

YEAR	TOTAL AREA ACQUIRED (Acres)
1911	32,426
1912	16,023
1913	11,777
1914	9,355
1915	3,640
1916	8,136
1917	5,593
1918	14,460
1919	16,459
1920	59,783
1921	17,761
1922	4,274
1923	766 (a)
1924	334 (b)
1925	172 (c)
1926	660 (d)
1927	607 (e)
1928	39,640
1929	118,001

Total area (January 1, 1930) 1,290,692 acres

- (a) Not purchased; 330 acres being acquired as vacant land and 46 acres received as a gift.
- (b) Five acres acquired through tax sales.
- (c) Only 100 acres purchased, the remaining 72 acres acquired as vacant land.
- (d) Only 203 acres purchased, the remaining 457 acres received as a gift.
- (e) Not purchased. Received as a gift.

A study of the foregoing table shows three important development periods in the purchase of land for State forest purposes:

Period I (1898-1921). Continuous acquisition of State forest land. From the appropriations made by the General Assembly during this 24-year period 1,133,051 acres were acquired, at a total cost of \$2,561,224.31, or at an average price of \$2.26 an acre.

Period II (1921-1927). Complete suspension of State forest purchase work, except for the completion of a few purchases covered by contracts made under the appropriation of 1919.

Period III (1927 to date). Active revival of State forest purchase program. The General Assembly of 1927 made an appropriation of \$500,000 for the purchase of forest land. With this appropriation 153,906 acres were added to the State forests. The General Assembly of 1929 made an appropriation of \$1,000,000 for the purchase of additional forest land. This was the largest appropriation ever made available for State forest land purchase work in the history of Pennsylvania forestry.

RECENT ENLARGEMENT OF THE STATE FORESTS

During the past two years (1928 and 1929), there have been added to the State forests of Pennsylvania, 157,641 acres. This is a greater area than was added during the previous 15 years (1913-1927). The area added in the single year 1929 (118,001 acres) is exceeded only by the areas acquired in the years 1902 and 1904.

These recent additions to the State forests were made possible by the special appropriations of \$500,000 in 1927 and \$1,000,000 in 1929. With the former appropriation 153,906 acres were added to the State forests, the average price being \$2.80 an acre. Since the million-dollar appropriation of 1929 became available on June first of that year, 104 tracts of land that aggregate 184,797 acres have been con-



A THRIFTY GROWTH OF YOUNG HARDWOOD TREES. PART OF A 14,000 ACRE TRACT ADDED RECENTLY TO THE STATE FORESTS IN CLINTON COUNTY



FOREST OBSERVATION TOWER ON NEGRO MOUNTAIN, SOMERSET COUNTY. THIS 5000-ACRE TRACT RECENTLY ACQUIRED FOR STATE FOREST PURPOSES CONTAINS THE HIGHEST POINT (ELEVATION, 3,213 FEET) IN PENNSYLVANIA

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16



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tracted for, the average price being \$2.83 an acre. The cost of title examinations and surveys is additional to the purchase price of the land itself.

It is estimated that a total of approximately 275,000 acres will be acquired with this appropriation of \$1,000,000. Thus, with the land that will be added to the State forests through the appropriations of 1927 and 1929, the State forests of Pennsylvania will contain more than 1,500,000 acres. During the four-year period 1927-1931, the State forest lands will have been enlarged by approximately 425,000 acres.

This forest land purchase program is the largest single project in Pennsylvania forestry today. The revival of this important line of work has made possible the greatest step forward in Pennsylvania forestry in recent years.

FURTHER EXTENSION OF THE STATE FORESTS

Although approximately 425,000 acres will be added to the State forests during the four-year period 1927-1931, there remains a large acreage available for future purchase. Most of the land acquired in recent purchases was secured to consolidate previous forest holdings of the Commonwealth. The greater part of these purchases was of lands surrounded by or adjacent to tracts already owned by the State. These purchases were made to bring about a more practical and economical administration of the forests.

A recent survey shows that many areas not



GREAT STRETCHES OF STATE FOREST LAND OCCUR IN THE HIGHLANDS OF PENNSYLVANIA

now within the State forests should be included in these forest tracts. Although there are State forests in 32 different counties of Pennsylvania, there are 35 counties that have no State forests. Some of these counties contain land that is suitable for State forest purposes.

In order that the State forests may be of the greatest service to the people of the Commonwealth, these forests should extend as far as possible toward the great centres of population. This is particularly true of forests that will be used to demonstrate good forest practices and also of forests that will serve as recreational centres. These outdoor centres for recreation, which are open to the people at all seasons of the year, will be a big factor in maintaining the health and promoting the welfare of the people of Pennsylvania.

There are many other excellent reasons why the State forests of Pennsylvania should be enlarged. One of the best reasons is the fact that the purchase of forest land is a first-class investment. It will pay the people of Pennsylvania generous dividends in happiness, health, and prosperity, and will return a large cash income on the investment.

HOW STATE FOREST LAND IS PURCHASED

The purchase of forest lands is handled through a special commission, known as the State Forest Commission. This Commission consists of five members who are appointed by the Governor. The chairman of the Commission is the Secretary of the Department of Forests

and Waters. This Commission has formulated a forest land purchase policy, and acts upon each separate tract that is considered for purchase. The experience of more than 30 years has shown clearly that the forest land purchase policy of this commission gives the State the necessary protection against excessive prices and unethical practices in the acquisition of forest lands. No State can point to a more business-like or more economical forest purchase program than Pennsylvania has enjoyed in the purchase of her State forest lands.

THE COOK FOREST PURCHASE

One of the few remnants of virgin forest still remaining in Pennsylvania is the Cook forest, a 6,000-acre tract of woodland that contains approximately 150 acres of original white pine and hemlock. This forest is located in the counties of Clarion, Forest, and Jefferson. The General Assembly of 1927 appropriated \$450,000 for the purchase of this land, the appropriation being contingent upon the raising of an additional \$200,000 by the Cook Forest Association. The money was secured, and on December 28, 1928, the Cook forest passed into the possession of the Commonwealth of Pennsylvania. This purchase was entirely independent of the regular forest land purchase work.

It is the purpose of the Department of Forests and Waters, which is charged with the administration of this tract, to perpetuate it in its natural condition for the people of Pennsylvania. The forest area surrounding about this choice

bit of original timber is being developed for forest park purposes. Special trails and look-outs have been constructed. Shelters, parking spaces, and an ample supply of good drinking water have been provided. Each year forest lovers in increasing numbers visit this rare beauty spot. A special little booklet on the Cook State Forest Park is available for free distribution.

HOW THE STATE FORESTS ARE HANDLED

The State forests are administered by the Department of Forests and Waters. At the head of the Department are the Secretary of Forests and Waters and the Deputy Secretary. The latter is also designated as the State Forester. The forestry work of the Department is handled through seven central bureaus and a State-wide field organization. The seven central bureaus are those of Forest Protection, Forest Management, Forest Parks, Forest Extension, Lands, Research and Information, and Accounts and Maintenance.

The Department of Forests and Waters not only administers the State-owned forests, but also cooperates with private owners in the care of forest trees and the proper handling of their woodlots. It is authorized to protect all forests in the State from fire and other injury, and is charged with the investigation of forest and tree problems and the general promotion of knowledge about trees and forests.

To handle its forests properly, and to give adequate assistance to private forest interests,

this Department has divided the Commonwealth into 25 forest districts. Of these districts 21 contain State forests. Each forest district is in charge of a district forester, who is aided by an assistant district forester, assistant foresters, forest rangers, forest inspectors, and other employees. All district foresters, assistant district foresters, and assistant foresters are technically trained, being graduates of forest schools of



THE HOME OF A STATE FOREST RANGER

collegiate rank. In the forest service of Pennsylvania there are now 56 foresters and 77 forest rangers. In addition to this regularly-employed personnel, several hundred temporary employees, paid on hourly or daily basis, are engaged in forest protection, tree planting, nursery work, road and trail building, telephone line and tower construction, improvement cuttings, and other forest operations. There are also more than

4,000 volunteer forest fire wardens throughout the Commonwealth. They are paid on an hourly basis for such time as they spend in the actual work of preventing, detecting, and suppressing forest fires.

Each person in the forestry organization is trained for a particular line of work. These public servants aim so to handle the State forests and assist private owners of forests that the forests of Pennsylvania will bring the greatest benefit to the people and the industries of the Commonwealth. With the forests in the hands of such trained men, we are assured of a practical and economical handling of our forest resources.

THE STATE FORESTS BELONG TO THE PEOPLE

The State forests of Pennsylvania belong to the people of the State. They are open at all times for proper use. Only a few special areas, such as game refuges, are closed to the public. The usual "No Trespassing" sign is not found on these public lands. Instead, one finds many signs that bear the message: "You are Welcome in the State Forests." Hikers, hunters, fishermen, vacationists, and nature lovers—all are welcome within the State forests. All that is required of visitors is that they use these forests with care and in the best interest of the general public. Visitors should always observe a few simple rules. They should be careful not to set the forest afire. They should protect trees from damage, keep the camps and park spaces they

use clean and neat, and obey the game and fish laws. Within the broad limits of these simple regulations it is possible for the people of Pennsylvania to go into their State forests and enjoy themselves in a liberal and profitable way.

RECREATIONAL OPPORTUNITIES IN THE STATE FORESTS

From the very beginning of the forestry movement in Pennsylvania, wholesome recreation



Courtesy Pomeroy's, Inc.

GIRL SCOUTS PREPARING A MEAL IN A STATE FOREST was recognized as a major objective in a well-balanced program of State forest administration. Three years before the first acre of State forest land was purchased, and six years before the Department of Forestry—now the Department of Forests and Waters—was created, the use of forest land for recreational purposes was

advocated by those favoring the creation of State forests.

The founders of Pennsylvania forestry acted wisely when they advocated the acquisition of forest lands by the Commonwealth, not only for the production of wood, but also to control floods, to provide health centres, and to assure outdoor recreation to all citizens of the State. On this broad and purposeful basis the State forests of Pennsylvania had their beginning, and today they are still administered in accordance with this sound humanitarian policy.

As a result of 30 years' experience in handling the State forests, and after a careful study of recreational developments in other states and in foreign lands, the Department of Forests and Waters has classified the recreational projects on the State-owned lands as follows:

- 1—State Forest Camp Sites
- 2—State Forest Camps
- 3—State Forest Parks
- 4—State Forest Monuments
- 5—Scenic Drives and Views

STATE FOREST CAMP SITES

A demand for extended camping privileges developed soon after the creation of the first State forests in Pennsylvania. To meet this demand a law was passed in 1913 authorizing the leasing of suitable camp sites to citizens of the Commonwealth. Under the provisions of this law, hunters, fishermen, vacationists, and other forest users are privileged to lease small areas in the State forests where they may build cabins, club houses, and cottages of approved



Courtesy Shumway Studio
THE BEAUTIFUL PINE CREEK GORGE IS OFTEN REGARDED AS THE WILDEST PART OF PENNSYLVANIA. IT CAN BE SEEN FROM THE LEONARD HARRISON STATE FOREST PARK

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As a result of 30 years' experience in handling the State forests, and after a careful study of recreational developments in other states and in foreign lands, the Department of Forests and Waters has classified the recreational projects on the State-owned lands as follows:

- 1— State Forest Camp Sites
- 2— State Forest Camps
- 3— State Forest Parks
- 4— State Forest Monuments
- 5— Scenic Drives and Views

STATE FOREST CAMP SITES

A demand for extended camping privileges developed soon after the creation of the first State forests in Pennsylvania. To meet this demand a law was passed in 1913 authorizing the leasing of suitable camp sites to citizens of the Commonwealth. Under the provisions of this law, hunters, fishermen, vacationists, and other forest users are privileged to lease small areas in the State forests where they may build cabins, club houses, and cottages of approved



Courtesy Shawway Studio
THE BEAUTIFUL PINE CREEK GORGE IS OFTEN REGARDED AS THE WILDEST PART OF PENNSYLVANIA. IT CAN BE SEEN FROM THE LEONARD HARRISON STATE FOREST PARK

designs. These camp sites can be secured by individuals, families, clubs, organizations such as the Boy Scouts, the Y. M. C. A., the Y. W. C. A., and other groups interested in the out-of-doors.

To handle these camp sites in a business-like way, special leases are granted for periods not exceeding ten years, with the privilege of renewal, at nominal rentals that range from \$7 to \$15 a year. In the early days of this camp site development it was possible for campers to lease areas as large as one or two acres, for then there were hundreds of unoccupied camp sites. With the rapid growth of the forest camp site movement, however, it became necessary to reduce the size of the camp sites. At the present time most of the camp sites leased in the State forests range in size from one-tenth to one-fourth of an acre. Experience has shown that sites of this size are ample.

The first camp site in the State forests of Pennsylvania was leased on October 21, 1913. By the end of that year 38 camp sites had been leased. From this small beginning in 1913, the camp site program has expanded rapidly. At the beginning of the year 1930 there were more than 2,000 camp sites leased in the State forests. The growth of the camp site movement is shown in the following table:

YEAR	NUMBER OF CAMP SITES LEASED (January 1)
1914	38
1916	252
1922	758
1927	1,636
1930	2,085



SUMMER CAMPING IS POPULAR. MORE THAN 2,000 CAMP SITES IN THE STATE FORESTS ARE LEASED TO CITIZENS OF PENNSYLVANIA



COTTAGES AND CABINS ERECTED ON STATE FOREST CAMP SITES ARE VALUED AT MORE THAN \$2,000,000

In selecting camp sites careful thought is given to the problem of sanitation. It is an established rule that no camp site may be leased within a distance of one mile from the intake of a water supply basin. In a zone one to two miles above such intake, camp sites must be fully 100 feet away from the stream, and in the two to three-mile zone, camp sites must be at least 50 feet from the stream. Toilet equipment must, in all cases, be in accordance with the rules of the Department of Health. The proper placing of all camps is of the greatest importance.

In order to insure proper location and to facilitate administration, the various district foresters make complete surveys of their forest districts and select the available camping sites. From these designated sites lessees may select those they choose. Thus a promiscuous location of sites, based wholly upon personal preferences, is not permitted. On the other hand, the selection of sites by the forest officials assures a coordinated plan of camp site locations that makes possible the development of a practical plan of forest management, and insures the greatest benefits to the largest number of people.

State forest camp sites are leased at nominal rentals ranging from \$7 to \$15 a year. In 1929 the total income from these leased camp sites was \$19,449.60. The estimated cost of the buildings erected on these camp sites totals approximately \$2,000,000. This substantial investment by the people of Pennsylvania is evidence of

their confidence in the stability of Pennsylvania's State forest camp site policy.

Each of the 2,085 camp sites now leased in the State forests is in effect a little recreational centre, particularly for those of moderate means. The latest records show that more than 100,000 people used these camp sites during 1929. With the enlargement of the State forests more areas will be opened for recreational use. This means that more and more people can enjoy the privilege of camping in Penn's Woods.

HOW TO SECURE A CAMP SITE LEASE

Any person wishing to secure a permanent camp site lease in the State forests should make application to the Department of Forests and Waters at Harrisburg, or to a district forester, on a designated form that will be supplied upon request. District foresters, forest rangers, or other forest officers will be glad to help applicants select suitable camp sites, and will assist in working out the details of the lease. A lease is made for a period not exceeding ten years, with the privilege of renewal. The annual rental of a camp site may be any sum from \$7 to \$15, depending upon the location of the site and other determining factors.

A lease must be executed by an individual or a chartered organization. When a club makes application for a camp site, it is very desirable to have the club chartered. If the club is not chartered, one of the members, acting as trustee, must execute the lease. The lessee is held responsible for the carrying out of the provisions

of the lease, which are simple, and which aim to insure proper protection to both the lessee and the Commonwealth.

Persons who desire more detailed information about the leasing of camp sites should write to the Department of Forests and Waters at Harrisburg, or communicate with a local forest officer and ask for Circular No. 25, entitled "Camp Sites on State Forests of Pennsylvania."

STATE FOREST PARKS

The need for special park areas arose early in the development of Pennsylvania's forestry program. To satisfy this need, eight areas, which vary in size from 15 to 425 acres, have been set aside as State forest parks. These eight parks are maintained primarily for tourists and picnickers who wish to enjoy, usually for a short period, outdoor life in a forest environment. These eight parks, and their locations by counties, are as follows:

STATE FOREST PARK	COUNTY
Caledonia	Franklin
George W. Childs	Pike
Hairy John's (Voneida)	Centre
Snyder-Middleswarth	Snyder
Leonard Harrison	Tioga
Colerain	Huntingdon
Kooser	Somerset
Patterson	Potter

State forest parks are quite different from State historic parks and parks maintained by municipalities, communities, and individuals. Each State forest park is provided with shelters,

tables, benches, fireplaces, comfort facilities, and other necessary park equipment. These parks are open throughout the year. No fee is charged for their use. They offer ample room and excellent facilities for picnics, sports, and nature study. The general rules of the State forests apply to them, excepting that the use of firearms is not permitted.

At these parks special efforts are made to



ONE OF PENNSYLVANIA'S ATTRACTIVE STATE FOREST PARKS

teach the lessons of the out-of-doors in a most practical, interesting, and helpful way. Throughout the parks direction signs point the way to worthwhile places. Unique or historic trees, historic sites, picturesque views, interesting forest tree plantations, scenic drives, forest fire observation towers, and similar interesting objects or places are called to the at-

tention by suitable signs that also point the way to the places they name. The State forest parks are for all the people; and those who visit them will enjoy them best if all will exhibit a true and proper spirit of outdoor fellowship and friendship.

CAMPS FOR THE PUBLIC

Forty-eight public camps are maintained in the State forests of Pennsylvania. These camps



CAMPING AND COOKING AT A STATE FOREST CAMP

are for the use of the public and are free of any charges whatever. Some of these camps are located along primary roads. These are fitted to accommodate automobile tourists who carry camping equipment. Other camps are located along secondary roads, and are used principally by hunters, hikers, fishermen, and picknickers who desire to go deep into the woods.

All State forest camps are equipped with fireplaces, benches, tables, garbage containers, and other conveniences for visitors. A supply of good water, which is examined regularly by representatives of the Department of Health, is available in all these camps. The average investment in each of these camps is approximately \$1,000, and campers are requested to be careful with fire, to leave a camp as they would like to find it, and not to abuse the equipment.

In order that the greatest possible number of people may be served by these camps, a rule has been established that a camper may not occupy a public camp for a period longer than two consecutive days. Persons wishing to remain longer than two days must secure a special camping permit from the local district forester for camping privileges at a special place designated by him.

An attractive and educational feature of these camps is the labelling of trees with signs that give both the common and the scientific names. Trails radiating from these camps are well marked with direction signs, which make it safe and pleasant to venture forth on hikes and nature journeys.

Those who desire fuller information about the camping privileges in the State forests should write to the Department of Forests and Waters at Harrisburg, or communicate with the local district forester.

STATE FOREST MONUMENTS

Nine special areas have been set aside in the

State forests and designated as State forest monuments. These areas range in size from 13 to 350 acres. They are regions of peculiar charm or beauty or are noteworthy for the plant life within them, or the remarkable rock formations, or for some other equally striking feature. They will be preserved in their wildness so that the people of Pennsylvania and their children, for generations to come, may have the privilege of seeing and studying these noteworthy remnants of Penn's Woods. Within these monuments plant and animal life is permitted to develop naturally, untouched by the hand of man.

These impressive beauty spots have been set aside under a special legislative enactment by which the Department of Forests and Waters is authorized "to set aside, within the State forests, unusual or historical groves of trees, or natural features, especially worthy of permanent preservation, to make the same accessible and convenient for the public use, and to dedicate them in perpetuity to the people of the Commonwealth for their recreation and enjoyment."

As most of the land within the State forests is developed primarily for wood production, no provision was at first made to preserve these areas of unusual natural beauty. It is, therefore, most fitting that these special areas should be set aside for posterity.

In the selection of the State forest monuments in Pennsylvania, special attention was given to unusual swamp areas, rare mountain tops, rugged scenic beauty, impressive stands of trees,

and other natural features that deserve permanent preservation. This program aims to make available special areas of singular beauty or unusual picturesqueness or scientific interest to all who wish to enjoy and refresh themselves in these primitive environs. No exact monetary value can be placed upon such a policy, but it can truly be said that the Commonwealth that stimulates and satisfies her people's desire for beauty helps to direct their energies toward the nobler and better things of life.

Practically all of the original forests of Pennsylvania have been destroyed. Of more than 28,000,000 acres of original timber fewer than 25,000 acres are left. Only in a few remaining areas is it now possible for one to see forest growth like that which covered the Commonwealth in the early days. Never again will such forests exist in this State. Therefore the responsibility rests upon us, as it has never rested upon any previous generation, to make sure that the few remnants of that virgin forest which still exist, shall be preserved for the enlightenment and inspiration of future generations. The creation of these monuments in the State forests is a direct effort to meet this responsibility.

Those who desire to learn more about these very interesting forest monuments will find a fuller description of them in a special bulletin called "In Penn's Woods," distributed free of charge by the Department of Forests and Waters, Harrisburg.

SPECIAL DRIVES AND VIEWS

Some of the most beautiful scenery and scenic drives within the Commonwealth of Pennsylvania are to be found in remote forest regions. Special efforts have been made during the past few years to discover and develop special drives and views within the State forests. The tree growth bordering these drives is maintained, so that the natural beauty shall not be marred.



ONE OF PENNSYLVANIA'S OUTSTANDING FOREST HIGHWAYS IS THE CHERRY SPRING'S DRIVE IN POTTER COUNTY. IT PASSES THROUGH THE LARGEST COMPACT AREA OF STATE FOREST LAND

Tree cutting within these areas is limited to improvement work. Within the State forests there are already more than 2,000 miles of roads and almost 3,000 miles of trails; and along this great stretch of roadways many vistas are being opened which will make it possible for the

forest visitor to behold some of the most beautiful views within this great Commonwealth.

STATE FORESTS INSURE GOOD HUNTING AND FISHING

Hunting and fishing are encouraged in the State forests of Pennsylvania. Many sportsmen consider the State forests their best hunting grounds. Within these forests, also, are some of the finest fishing streams in the Common-



THE STATE FORESTS AFFORD EXCELLENT FISHING

wealth. Fully 200,000 hunters and 100,000 fishermen hunted or fished in the State forests in 1929. Although the State forests comprise only one tenth of the total forest area of the Commonwealth, they regularly supply almost one half of the deer and more than one third of the bears shot by hunters in Pennsylvania. They also supply large quantities of small game.

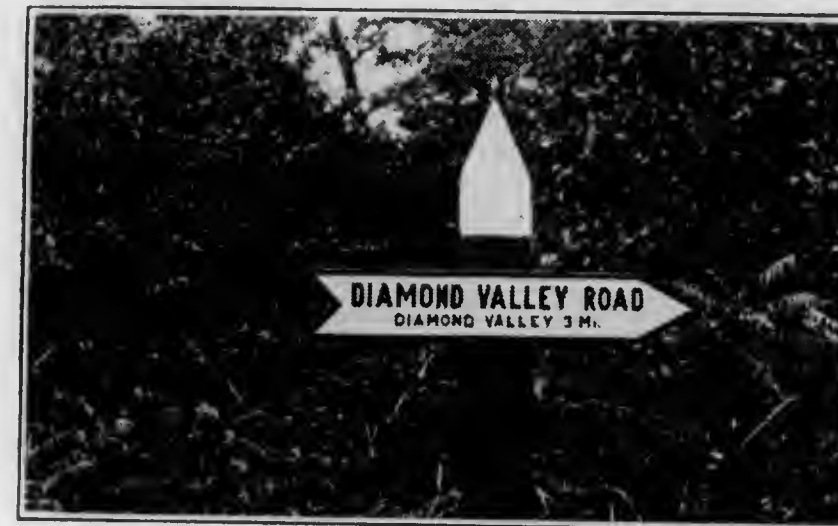
The development of roads within the State forests is a wonderful help to hunters and fishermen. The State forest service aims to develop good roads and trails through the State forests as rapidly as funds will permit. This road and trail development campaign, already well under way, will open vast areas of forest lands that were formerly inaccessible for hunting and fishing. Each year the opportunities for sportsmen are being improved. Streams are being stocked with fish, and within the better-protected forests game constantly becomes more abundant. Within the State forests are located 20 game refuges and 13 auxiliary game refuges, the combined area of which is approximately 50,000 acres. In these refuges game breeds and multiplies unmolested, and from these centres constantly flows out a strong stream of animal life to replenish that of the surrounding forests.

HANDY MAPS FOR STATE FOREST USERS

Handy pocket-size maps of most of the State forests are now available. These are called "Public Use Maps." They show the location of State-owned lands, together with the forest roads, trails, streams, and other natural features. To help hunters, fishermen, and others who visit the forest, thousands of direction signs have been erected, which point the way and give the distances to various roads, trails, streams, camps, and towns. Provided with Public Use Maps, and guided by these signs and markers, which are placed at practically every turn of the way, any one may venture into the forest

with perfect safety. There is no danger of becoming lost. Public Use Maps can be secured upon application to the Department of Forests and Waters, Harrisburg.

Furthermore, one cannot go far into a State-owned forest without meeting a forester, forest ranger, or some other forest worker. Through years of service these men have been trained to welcome and help visitors. No matter how busy



THE STATE FORESTS ARE WELL POSTED
WITH ATTRACTIVE SIGNS

forest officers are with their regular work, they are always ready to serve visitors in the State forests. This note of courtesy and hospitality is one of the pleasing features of the State forests.

MAKING THE STATE FORESTS MORE ACCESSIBLE

Each year the State forests of Pennsylvania become more accessible. When these forest lands

were acquired, practically all of them were cut-over, burned-over, remote, and inaccessible areas that were seldom visited by any one. Whatever roads were within them had been developed primarily to bring out logs and not for the purpose of making the woods accessible. Substantial progress has already been made in building and maintaining serviceable roads and trails through these State forest lands. At present there are more than 2,200 miles of roads and 2,800 miles of trails within the State forests.

More than \$200,000 was spent on these roads and trails in 1929. The work done during that year was the most extensive piece of road and trail development work ever attempted by the Pennsylvania forest service. Each year it becomes more and more evident that serviceable forest roads are essential to good forest management. Without good roads and trails only the crudest kind of forest management is possible. Wherever we see, throughout the State, forests that are well kept and well cared for, we may know that in large measure this better condition is due to better roads and trails.

However, there is still much to be done. At least 5,000 miles of serviceable roads will be required to insure efficient management of the State forests. Although this mileage may seem large at first, the need for so many miles of road becomes obvious when we consider that several hundred years of European forest practice, under conditions which, in many respects, are similar to those in Pennsylvania, show that for good management one mile of road is needed for



MANY STATE FOREST ROADS COMBINE BEAUTY AND SERVICE. THERE ARE MORE THAN 2,000 MILES OF ROADS IN THE STATE FORESTS



AN ATTRACTIVE AND SERVICEABLE TRAIL ON THE MONT ALTO STATE FOREST. THERE ARE ALMOST 3,000 MILES OF TRAILS IN THE STATE FORESTS OF PENNSYLVANIA

every 250 acres of forest land and under intensive forest management one mile of road is necessary for every 100 acres of forest land.

The most urgent need today is not for short, detached stretches of road, but for a coordinated system of properly-located, well-graded, adequately-drained, and carefully-constructed forest roads. When such a road system has been developed, a firm foundation will have been built for the efficient handling of the State forests of Pennsylvania.

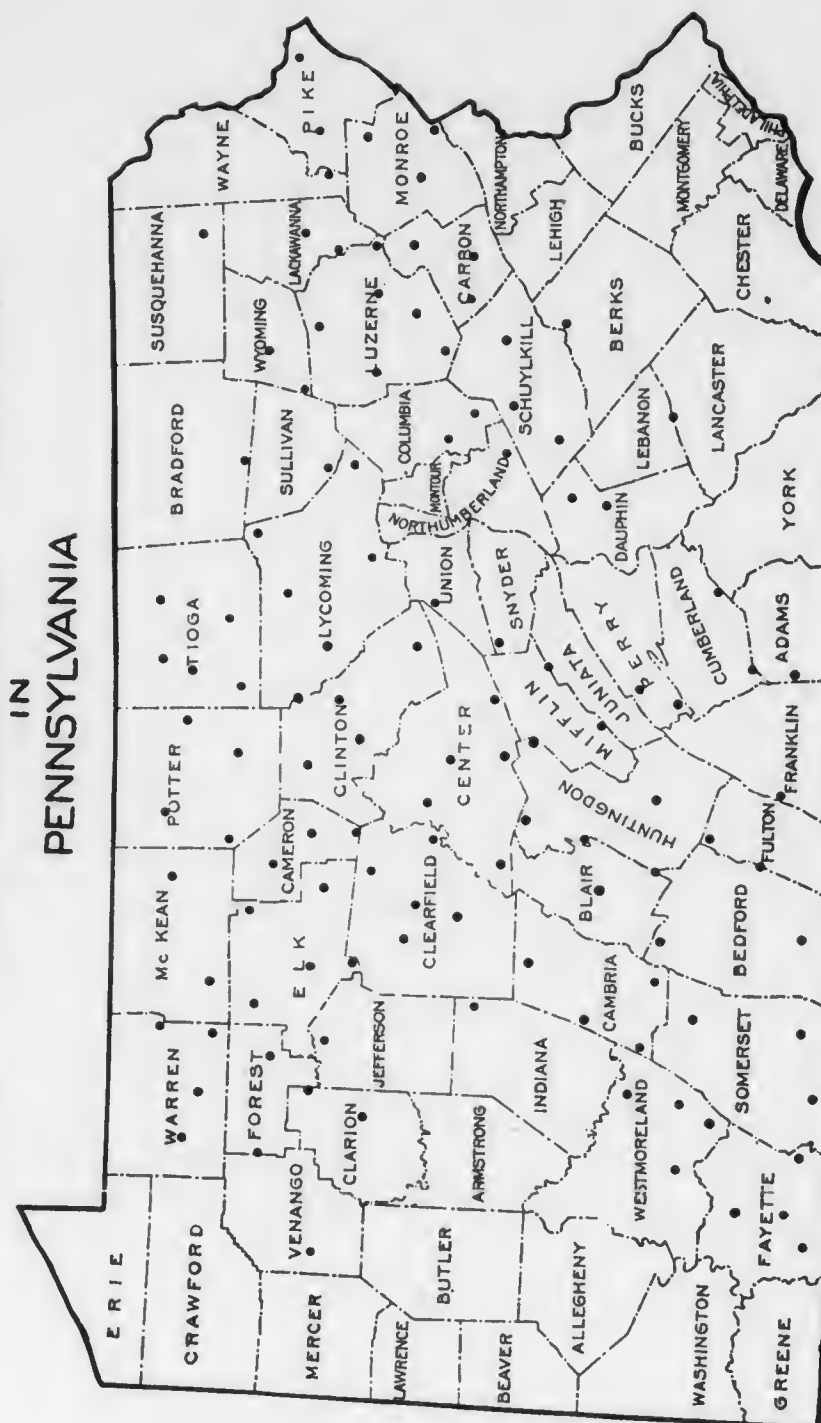
FIRE—THE GREATEST ENEMY OF OUR FORESTS

More than axe or saw, and probably more than insects or disease, fire has been the greatest enemy of our forests. In Pennsylvania there are vast areas that can produce only one sort of crop, and that is a crop of trees. Forest fires, more than any other single agency, prevent the production of these necessary crops.

Not all fires are equally destructive. Some fires do great damage; others do relatively little. But one thing is certain: every forest fire does some damage. Usually the fire damage is greater than is apparent, for fires do far more than merely kill the trees. In many cases they put an end to practically all forest life within large areas. They may even burn the life out of the forest soil.

Forests, irrespective of their ownership, cannot flourish as long as forest fires burn. We need to plant trees on devastated mountain sides. We need more study plots within our

FOREST FIRE OBSERVATION STATIONS
IN
PENNSYLVANIA



forests, to show the way to good forest practices; but we must be assured that our study plots shall not be consumed by fire after they are established. There are many other forest activities that cannot move forward until the woods are safe from fire. The greatest single obstacle to the practical and efficient handling of our forests today is fire. The success of forestry hinges primarily upon the control of forest fires.

STATE-WIDE PROTECTION AGAINST FOREST FIRES

When the Commonwealth began to buy forest land, 32 years ago, no organized attempt was made to control forest fires. The first efforts at fire control were limited to State-owned forest lands. But years of experience and careful study of the forest fire problem proved conclusively that "spotted" control measures could never be effective. What was needed was an efficient State-wide system of forest fire protection.

By an act of the General Assembly, passed in 1915, the Bureau of Forest Protection was organized, in the Department of Forestry, for the primary purpose of developing just such a State-wide protective system. During the past 15 years an organization has been built up that is getting results. As late as 1913 less than one half of the forest fires that started in Pennsylvania were reported to the forestry officials. Today more than 98 per cent of all forest fires in this Commonwealth are reported promptly.

Efficient and fully equipped fire crews are immediately despatched to extinguish them.

Pennsylvania's forest fire-fighting organization has built around her 56 technically trained foresters and 77 forest rangers, who are supported by trained crews of forest fire fighters, together with more than 4,000 forest fire wardens who are located at as many points throughout the Commonwealth, and who are particularly numerous in those sections where forest fires occur most frequently and do the greatest damage.

The reduction in the average size of forest fires in this State shows how well this fire-fighting organization is functioning. The average size of a Pennsylvania forest fire in 1913 was 412 acres. Two years later the Bureau of Forest Protection was organized. By 1918 the average size of forest fires in this State had been reduced to 140 acres. Five years later, in 1923, the average forest fire burned 105 acres. In 1928 the average size of a forest fire in Pennsylvania had decreased to 45 acres.

Despite this gratifying achievement in cutting down the size of forest fires, they are still the most serious problem in Pennsylvania forestry. The latest figures available show that in 1928 there were 2,456 fires in the forests of this Commonwealth. These fires burned over 110,872 acres. The estimated damage is placed at \$360,000. The Commonwealth's share of the cost of extinguishing these fires was \$103,305.60. Analysing these figures, we see that the fire damage averaged almost \$1,000 for every day in the

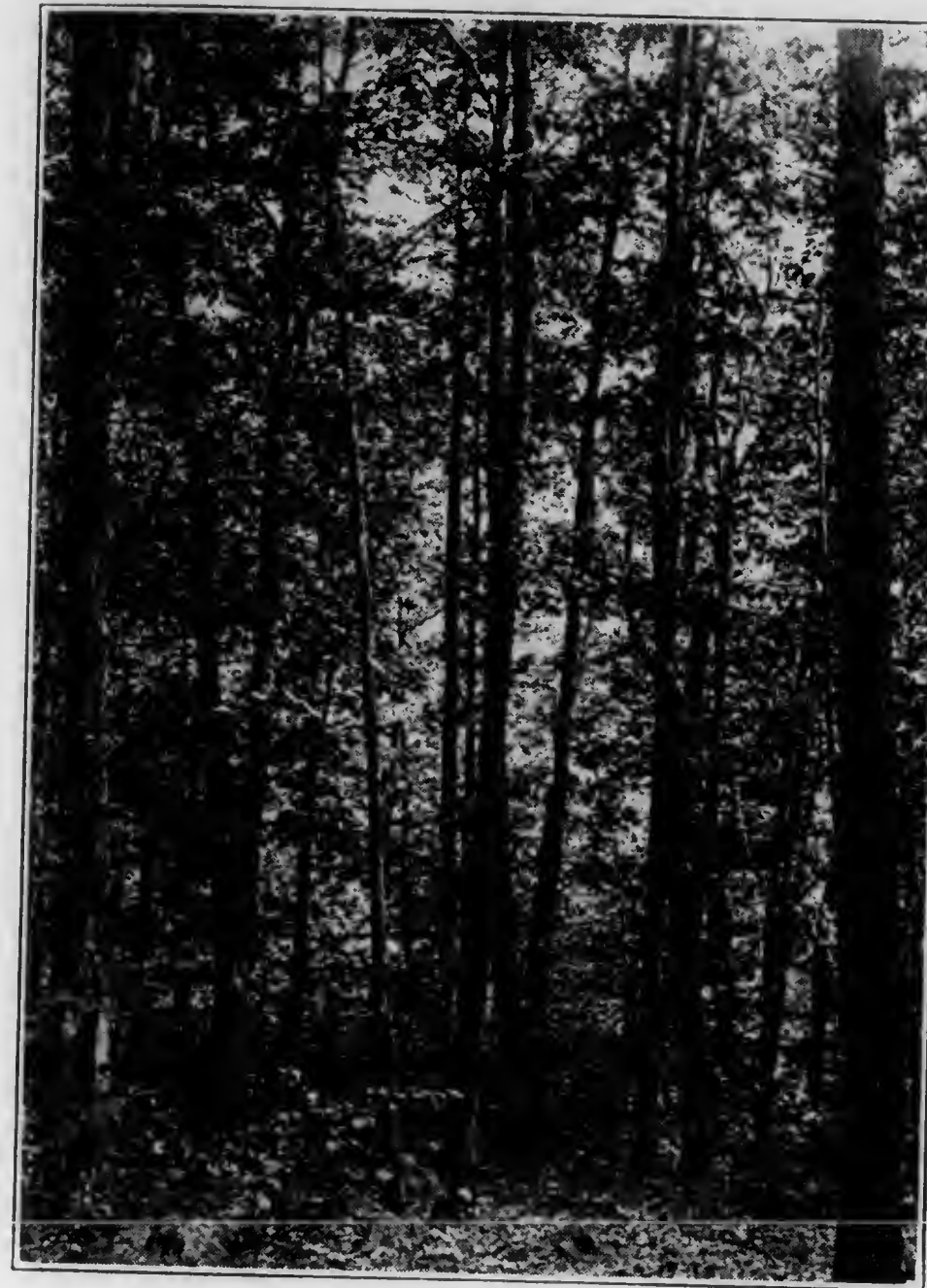
year, and the cost to the State for extinguishing these fires averaged almost \$300 a day.

GREAT PROGRESS IN CONTROL OF FOREST FIRES

The substantial progress that has already been made in controlling fires in the State forests is a reassuring indication of what can be done along this line under State ownership. The progress made is strikingly shown by the following tabulation. The statistics begin with the year 1913, and cover the ensuing 16 years, during which period detailed figures in regard to forest fires have been compiled. These figures show the percentage of the State-owned forest land that has been burned over during each three-year period in the time indicated. The figures follow:

YEARS	PERCENTAGE OF STATE FORESTS BURNED
1913	7.21
1914-1916	2.32
1917-1919	1.28
1920-1922	1.17
1923-1925	.60
1926-1928	.34
1929	.01

Analysing the foregoing table, we find that the average rate of reduction in the area burned over is 45 per cent for each three-year period, or 15 per cent annually. It is a noteworthy fact that during the last seven years considerably less than one per cent of the State forest land was burned over annually. To hold the fire losses to this small figure is a remarkable achieve-



UNDER STATE OWNERSHIP PROMISING STANDS
OF THRIFTY FOREST TREES ARE REPLACING
UNPRODUCTIVE WASTE AREAS

ment. It is all the more creditable because it was accomplished at a time when there was an unusually large area of cut-over and brush land in the Commonwealth. Experience the world over shows that young, cut-over forests and brush lands are most difficult to protect. As cut-over forests grow older, they are in better condition to withstand the fire evil. Not only has the slash rotted, but also the forest floor is relatively moist and damp.

Another factor that constitutes a very great hazard to the forest is the presence of so many careless smokers in the woods. Twice a year, during the spring fishing season and again in the autumn, during the hunting season, the forests of Pennsylvania are alive with men. Many of them are smokers. Carelessness with tobacco and matches causes hundreds of fires in the Pennsylvania forests. This is a hazard that did not exist to nearly so great an extent a few decades ago. Yet in spite of it and of the great area of cut-over woodland, the area burned over yearly becomes smaller.

Time fights on the side of the forester. With every passing year, more of Pennsylvania's forests emerge from the extra-hazardous period of young growth, and are less likely to burn. The public is slowly being educated to exercise greater care with fire in the woods. And the fact that hundreds of people now own permanent camps in the State forests is another safety factor. Every man whose camp or cottage is at stake becomes an active worker against forest fires. Altogether, the factors that make for pro-

tection against fire are slowly but surely growing.

To continue successfully the program for protecting the forest from fire, a well-organized and thoroughly trained fire-fighting organization must be maintained. First class equipment and constant improvements are needed. Foremost among the equipment needed is the forest fire tower. Without such lookouts forest fires cannot be detected promptly. To date 115 forest fire observation towers have been erected in various parts of the Commonwealth. The total cost of these structures exceeds \$100,000. With a very few exceptions these towers are built of steel. Most of them are 60 feet high. Some of the newer ones are 80 feet in height. These towers are connected with the headquarters of the local district foresters and of the various local forest rangers by more than 800 miles of State-owned telephone lines.

In all parts of the Commonwealth these fire towers stand guard over the forest. They are found in the vast, denuded reaches of northern and central Pennsylvania, and in the smaller and more scattered forests in the agricultural areas of the Commonwealth. The few remaining tracts of big timber and the great stretches of cut-over lands are alike protected by these lofty watch towers. Thirty-one of them are situated in the State forests and 84 on privately-owned forest lands. During 1929 ten new steel towers were erected.

Supplementing these towers in the task of suppressing forest fires, more than 2,200 miles



ONE HUNDRED AND FIFTEEN FOREST FIRE OBSERVATION
TOWERS HAVE BEEN ERECTED IN ALL PARTS
OF PENNSYLVANIA

of roads and 2,800 miles of trails lead through the State forests. Over these forest roads fire crews can travel quickly, often to the very scene of a fire, and choke it before it has fairly started. The fire tower and the well-kept forest road are indispensable units in the fire-fighting equipment. Whether it be towers or roads or tools that are essential, the forest-fire fighters must be fully equipped. The work of protecting the forest from fire must be pushed to the highest possible degree of efficiency. Unless this is done there can be no hope for our forests.

We must push forward with this work because the forests are absolutely essential to the welfare of the Commonwealth. Protection from fire does far more than merely promise an adequate wood supply. Productive forests mean millions of dollars to wood-using industries. They furnish added employment in rural communities. They safeguard our watersheds and conserve our water supplies. They provide better hunting and fishing. They produce regions of marvelous beauty and sylvan splendor. They are the finest possible places for recreation and the refreshment of body and mind. In countless ways the forests contribute to our welfare. They are a priceless heritage which must be protected at all costs.

STATE NURSERIES PRODUCE MILLIONS OF TREES

When the Commonwealth came into possession of her first purchase of forest lands, she found hundreds of acres so completely devastated by

lumbering and forest fires that it was often difficult to find a single specimen of any important forest tree on an entire acre of land. A thorough study of these denuded areas showed conclusively that there was only one practicable way to reforest them: that was by replanting them with trees. Thereupon the big problem of how and where to get the trees for planting presented itself. Almost at once it became evident that the only way to insure an ample and regular supply of trees for planting was to grow them from seed. Hence, forest tree nurseries were established to supply the necessary seedlings and transplants.

The first forest tree nursery to be operated by the State was established at Mont Alto, in Franklin County, in 1902. Today there are three large nurseries and one small one in operation in the State forests. The large nurseries are located at Mont Alto in Franklin County, at Clearfield in Clearfield County, and at Greenwood Furnace in Huntingdon County. A small nursery for transplants is also operated near Potters Mills in Centre County.

During the 28 years that its nurseries have been in operation, the Department of Forests and Waters has produced and distributed more than 121,000,000 seedlings and transplants. More than 9,000,000 of these little trees were shipped during the Spring of 1929. The fall inventory for 1929 shows a total of 31,000,000 trees in these several nurseries, most of them being one-, two-, and three-year-old seedlings.



GENERAL VIEW OF THE MONT ALTO NURSERY. MORE THAN 120,000,000 SEEDLINGS AND TRANSPLANTS HAVE BEEN DISTRIBUTED FROM THE STATE NURSERIES FOR PLANTING IN PENNSYLVANIA

Approximately 10,000,000 of these little trees will be ready for shipment during 1930.

Pennsylvania's forest tree nurseries are among the best of their kind in the United States. They have been a big factor in promoting forestry and in restoring thousands of idle acres of forest land to renewed production. The big reforestation task that is still ahead insures their continuation.

MANY TREES PLANTED ON PRIVATE FOREST LANDS

After forest tree planting in the State forests had been in progress for a decade, a considerable demand arose among owners of private forest lands for trees to plant on their idle acres. They wanted trees like those the State was growing and planting. To satisfy this demand, and to forward a State-wide reforestation program, the Department of Forestry, as this Department was then called, was authorized by law to cooperate with land owners by supplying them with forest tree planting stock at the cost of production. In 1910 this cooperative plan was first put into effect. At a cost ranging from \$1.00 to \$3.00 a thousand, 66,374 trees were distributed from the State nurseries during that year.

From the very beginning this program to reforest private forest lands moved forward rapidly. A comparison of the planting figures for the first three years (1910-1912) with the figures for the last three years (1927-1929), shows strikingly how this reforestation movement has gained momentum:

FIRST THREE YEARS (1910-1912)

Year	Number of Tree Planters	Number of Trees Planted
1910	23	66,374
1911	24	25,360
1912	20	66,854
Total		158,588

LAST THREE YEARS (1927-1929)

Year	Number of Tree Planters	Number of Trees Planted
1927	3,434	13,926,018
1928	2,254	9,882,310
1929	1,512	8,133,336
Total		31,941,664

A study of the foregoing tables shows that more than 200 times as many trees were distributed during the three years 1927-1929 as were sent out during the three years 1910-1912. All this growth in forest tree planting has come about within two decades; and it is a noteworthy fact that during those twenty years the impressive total of 82,663,738 trees has been distributed from the State nurseries to private planters in all parts of the Commonwealth.

Under the present distribution plan, the Department of Forests and Waters is authorized to grow and sell forest tree planting stock at a price not to exceed the average cost of production and shipment. The present sale price is \$2.00 a thousand for seedling trees and \$5.00 a thousand for transplants. No order will be filled for fewer than 1,000 trees. This minimum

shipment will reforest almost an acre of land if the trees are spaced 6 x 6 feet apart. If the trees are planted at intervals of 4 x 5 feet, 1000 trees will plant almost half an acre. The planting of less than half an acre of land is not regarded as a reforestation project.

The rapid and continued growth of forest tree planting in Pennsylvania shows how general has been the approval of the State's re



WHITE PINE AND RED PINE PLANTATIONS OF YORK WATER COMPANY. WATER COMPANIES HAVE PLANTED MORE THAN 10,000,000 TREES SECURED FROM THE STATE NURSERIES

forestation program. It also indicates how scientific forestry practice in the State forests is blazing the way for similar activities in the private forests.

Those who are interested in this subject of reforestation and forest tree planting can obtain detailed information along any desired line

of this work by writing to the State Forester at Harrisburg, or by applying to their local district forester, whose name and address appears on the last pages of this booklet.

THE STATE HAS PLANTED ALMOST 39,000,000 TREES

During the last 30 years 38,874,093 trees have been planted in the State forests of Pennsyl-



SOME STATE FOREST PLANTATIONS HAVE ALREADY REACHED SIZE LARGE ENOUGH TO YIELD CORDWOOD OF VALUE

vania. The average cost of planting an acre has been \$10.02. In consequence of all this work, there are now approximately 26,000 acres of thrifty plantations in the State forests. The trees planted consist of white pine, red pine pitch pine, Scotch pine, Norway spruce, white ash, red oak, and many other important forest

trees. Some of the older trees in these plantations are already 30 to 50 feet high.

The planting of forest trees in the Pennsylvania State forests began in a very small way. The first trees planted were set out on October 1, 1899, in the southern part of Pike County. The first plantation consisted of only 1,000 trees. The next year 1,500 trees were set out. In 1901 no planting was done. In 1902 and 1903 the number of trees planted was 5,000 in the first year and 1,600 in the second. Thus, in the first five years of planting operations, only 9,100 trees were set out.

Beginning in 1904, there was a rapid increase in planting activities. In the second five-year period (1904-1908), 284,808 trees were planted. At that time the planting of 100,000 trees in a single year was regarded as a very large operation. Today we should consider it a small operation. During the decade that followed (1910-1919), the annual planting varied from 1,000,000 to 6,000,000 trees. The largest number of trees ever planted in any one year in the Pennsylvania forests was in 1918, when 6,033,760 trees were set out. If this number of trees is spaced six feet apart each way, it will reforest approximately 5,000 acres.

The greatest number of trees planted in any one year during the last decade was set out in 1929. Then 1,134,525 trees were set out in the State forests. The planting for this one year exceeded the number of trees put out during the first ten years of the State's tree planting work.

How rapidly tree planting has increased in

Pennsylvania, in both the State forests and on private forest lands, is well shown by the following table:

Year	Number of Trees Planted in State Forests	Number of Trees Supplied to Private Planters from State Forest Tree Nurseries
1899	1,000	.....
1900	1,500	.....
1901	.....	.....
1902	5,000	.....
1903	1,600	.....
1904	7,700	.....
1905	40,000	.....
1906	99,550	.....
1907	36,930	.....
1908	100,628	.....
1909	738,461	.....
1910	1,092,213	66,374
1911	1,663,061	25,360
1912	1,890,404	66,854
1913	3,164,637	47,770
1914	3,393,571	108,685
1915	4,315,436	115,577
1916	5,492,020	1,471,875
1917	3,595,720	1,812,997
1918	6,033,760	2,186,899
1919	2,132,547	3,139,531
1920	238,298	2,543,374
1921	177,960	3,041,707
1922	133,221	3,670,521
1923	551,462	5,424,116
1924	424,380	8,577,464
1925	362,100	8,604,091
1926	560,525	9,768,879
1927	559,635	13,926,018
1928	926,649	9,882,310
1929	1,134,525	8,133,336
Total	38,875,093	82,663,738

HUGE QUANTITIES OF TREE SEED REQUIRED

Huge quantities of forest tree seed are required annually to provide the planting stock used in reforestation work in Pennsylvania. During the years 1927 and 1928 a total of 2,286 bushels of cones was gathered from coniferous trees, from which 2,000 pounds of clean seed were extracted. During the same period 250 bushels of seed from broad-leaf trees were also



WHITE PINE CONES READY FOR SEED EXTRACTION

collected. These seed were from such trees as the black walnut, red oak, white oak, and basswood. The total cost of collecting this seed, plus the cost of extracting the seed of the conifers, was \$3,925.

In addition to the seed collected within the State, 2,448 pounds of seed were purchased during 1927 and 1928 at a cost of \$7,875, thus mak-

ing a total expenditure for tree seed of \$11,800.

Although it has been necessary in the past to purchase large quantities of seed, the Pennsylvania Department of Forests and Waters plans in the future to collect within the State itself all the good seed it is possible to gather. This will effect a big saving in money and insure a better quality of seed. It is particularly important that attention be given to the matter of securing seed of the best quality, for it takes a tree crop 50 to 100 years to mature. Hence, if seed of poor quality is sown, the mistake cannot be corrected for probably a century.

FOREST TREE SEED SUPPLY STATIONS

To provide forest tree seed of known origin and quality, for use in the State nurseries, the author a few years ago established various tree seed supply stations. These seed supply stations are selected forest areas stocked with trees of superior quality. These stations are maintained primarily for the purpose of producing high quality seed for use in growing forest tree planting stock. The greatest care is given to the selection and development of these seed-producing areas. All inferior trees found growing within the selected areas are removed, so that none but trees of superior seed-producing quality remain.

The first seed supply station was established in 1927 in a plantation of Scotch pine in the Mont Alto State Forest. The trees in this stand are unquestionably among the finest trees of their age and kind in this country. A second

seed supply station was established in a natural stand of white pine at Greenwood Furnace, in Huntingdon County. Additional stations are being established as rapidly as the Department's funds will permit. Special groups of trees and individual specimens are also designated as approved sources of quality seed.

It is the purpose of this Department to establish most of these seed supply stations within the State forests. A number of stations will, however, be located on privately owned land through the cooperation of the owners. In future years it will be possible for the Department to grow extra fine stands of trees for the express purpose of seed production.

Probably nothing the Department is attempting at this time is fraught with more far-reaching significance than is this effort to secure an improved seed supply. The ever-growing reforestation movement calls for a constantly enlarged production of seedling trees. These trees should be of the best quality it is possible to obtain, for it is these tiny seedlings that will determine the character of the State's timber supplies half a century hence. To grow good planting stock, it is necessary to have good seed. And good seed cannot be guaranteed unless its source is known. The only sure way to have superior seed is to collect it from trees of approved quality. By seeking out and setting aside superior stands of trees, the Department of Forests and Waters is taking steps to insure for all time the quality of the seed it sows in its forest tree nurseries.

This plan of establishing forest tree seed supply stations was first undertaken in Pennsylvania in 1927, and has since that time received wide attention in other States. But Pennsylvania has gone even farther with its tree seed program. Not only does the State secure seed from these quality seed supply stations, but just as carefully studies the collected seed and classifies it after it is harvested. No effort is



WHITE PINE SEED TREES SELECTED AND MARKED FOR QUALITY SEED PRODUCTION

spared to make sure that the seed which is actually put into the ground is of the highest quality it is possible to obtain. The successful development of this program will constitute a big step toward the production of certified forest tree seed. Such seed is fully as important in forestry as it is in agriculture, horticulture, and other crop-growing industries. The results of

this effort to improve the quality of forest tree seed will be apparent half a century hence in the improved stands of trees that will cover the forest lands of Pennsylvania.

STATE FORESTS ARE BECOMING MORE PRODUCTIVE

In addition to the planting of forest trees, Pennsylvania's program of forest restoration calls for protection, improvement cuttings, and many other activities. Already these operations are bringing about a great change. When the State forest lands were acquired, most of them were in a devastated condition. Practically all merchantable trees had been removed from the land, and the few that the lumbermen did not take had been destroyed by fire.

Under State ownership these barren wastes are rapidly being converted into productive forests. Where originally were vast areas of cut-over and burned-over lands there are now promising stands of thrifty trees. Furthermore, the character of the tree stands has changed for the better. In many areas that were formerly occupied by such inferior trees as scrub oak, fire cherry, and aspen, important forest trees are now growing. Large areas are already covered with important forest trees in sapling or polewood size, and it will not be many years more before they will reach merchantable size.

Throughout these stands of young and middle-aged forest trees, numerous special study plots have been established. The results of the studies

made in these plots already indicate that the well-protected and well-cared-for forests of Pennsylvania are growing fully as rapidly and promise as high returns as the intensively managed forests of Europe.

HANDLING THE STATE FORESTS IS BIG BUSINESS

The State forests of Pennsylvania now embrace (January 1, 1930) 1,290,692 acres of forest land. This area represents about one tenth of the total forest land in the Commonwealth. And under the present purchasing program approximately 275,000 acres will be added to these forests during the next few years. This will bring the total area of the State forests to approximately 1,500,000 acres.

In handling this great area more than 250 persons are already given regular employment. Several thousand others are given part-time work in fighting forest fires, planting trees, constructing and maintaining roads, and in other forest activities. As our forests mature, work will be available for a far larger number of people, both in the forest itself and in the industries that will depend upon these forests for their raw material.

When, in 1860, Pennsylvania led all other States in lumber production, there was plenty of work in the woods. Today Pennsylvania ranks twenty-second in lumber production, and there is very little work in the woods. The restoration of our forests means the restoration of innumerable jobs. Where now there are only a

few people at work in the woods, the future will see thousands profitably employed. The destruction of our forests meant not merely the end of the timber supply. It also caused the wiping out of hundreds of homes and many towns. The restoration of the forests will mean the restoration of homes and communities within or near the forests.

Even more pleasing is the thought that these future forest communities will be established on a permanent basis. Never again will the forests of Pennsylvania be destroyed as they were in the past. In the future the timber will be harvested as successive crops become mature, but the forest will exist indefinitely, producing wood and other important products continuously. The highest ideal of forestry is to make the forest permanently productive. When this is accomplished, the forests will be far more useful to man than they have been in the past. They will then have reached their greatest possible usefulness.

The State forests of Pennsylvania constitute a big and profitable business. They have more than doubled in value since they were purchased. Their present worth is conservatively estimated at considerably more than \$15,000,000. The net gain in their value is conservatively estimated at more than \$5,000,000. This figure is established on the assumption that the value of the hunting, fishing, and other recreational privileges at least equals the interest charges on the investment. We know that these privileges are actually worth more than that. In addition to



FORESTED HILLS INSURE HAPPINESS AND PROSPERITY TO MANY RURAL HOMES AND COMMUNITIES THROUGHOUT PENNSYLVANIA

the monetary value of the State forests, we must not overlook the fact that they also pay beauty dividends every day of the year.

STATE FORESTS HELP TO PAY THE TAXES

The Constitution of Pennsylvania provides that public property which is used for public purposes may be exempt from taxation. Accordingly, the General Assembly has passed laws prohibiting local district governments from levying taxes upon State forest lands. This policy, it was early discovered, would work hardship upon certain local districts, particularly in regard to the maintenance of schools and roads. A careful study of the situation showed the necessity of providing some form of relief. Accordingly, the General Assembly provided for the payment to the affected districts, in lieu of taxes, of five cents a year for each acre of State-owned forest land. This sum is distributed as follows: two cents an acre per annum is paid to the local township school board; two cents goes to the local township board of road supervisors; and one cent is paid to the county treasurer for county expenses. This rate of payment compares very favorably with the amount of taxes that would be received if the forests were in private hands.

For the year 1929 the sum thus paid by the Commonwealth through the Department of Forests and Waters totaled \$61,510.50. This went in lieu of taxes to 206 school districts, which received \$24,628.82; to 205 road districts, which also received \$24,628.82; and to 32 county treas-

urers, who received \$12,252.86. The largest sum paid to any single district was that given to Stewardson Township, in Potter County, where the school board and the road supervisors each received \$882.80. Chapman Township, in Clinton County, came second, and received \$803.66 for schools, with an equal sum for township roads.

STATE FOREST RECEIPTS GROW RAPIDLY

With the State forests handled like any other business project, it is natural to expect an income from them; and records show that from the very beginning these State-owned lands have produced a substantial revenue. In 1900, the second year after the first purchase of State forest lands was made, the income from the sale of forest products was \$1,227.87. During the first five years receipts totaled \$15,890.10. From this small beginning the receipts from the State forests have grown until they now average very nearly \$60,000 a year.

This growth in State forest receipts can best be appreciated by comparing the income of the first five years with that for the last five years. The following table sets forth the figures:

FIRST FIVE YEARS (1900-1904)		LAST FIVE YEARS (1925-1929)	
Year	Amount	Year	Amount
1900	\$1,227.87	1925	\$68,607.28
1901	1,951.57	1926	50,943.44
1902	1,578.70	1927	62,263.66
1903	9,758.02	1928	60,994.98
1904	1,373.94	1929	54,879.08
Total	\$15,890.10		\$297,688.44

The total receipts from the State forests of Pennsylvania, up to December 31, 1929, amounted to \$817,012.11.

STATE FOREST INCOME GOES TO PUBLIC SCHOOLS

Many people wonder what becomes of the income that is derived from the State forests. During the first ten years of the State forest administration, the income was deposited in the General Fund of the State Treasury, or was used to defray necessary expenses incurred in protecting or improving State forest land, or for the purpose of buying additional land. By an act of May 18, 1911, however, 80 per cent of the net receipts from the State forests was placed in a special fund known as the "State School Fund." The remainder of the receipts went to the General Fund of the State Treasury. On June 4, 1915, an act was passed by which all net receipts derived from the State forests are deposited in the State School Fund.

This transfer of the State forest income to a special fund for the use of the public schools is one of the best provisions in any State forestry program in America. In years to come, the State forests of Pennsylvania will help greatly in maintaining our public schools. Already, the sum paid over from the forest income to the school fund totals \$503,031.66. During the past five years the deposits in this school fund from forest revenues were as follows:

YEAR	AMOUNT
1925	\$26,421.39
1926	30,799.73
1927	50,428.29
1928	38,796.15
1929	36,773.12

Total \$183,218.68

STATE FORESTS WILL PAY BIG DIVIDENDS

The income from the State forests has already reached a substantial figure. When we consider this matter of forest income, we must remember that Pennsylvania forestry began with cut-over and burned-over land. Much of this land was completely denuded—bare to the very rocks. The rebuilding of a forest is a slow process. It requires many years to produce forest trees and grow them to maturity. This is especially true when most of them must be grown from seed. The early period in a planted forest is one that produces no revenue. But after the trees reach a certain age, the forest begins to yield some return. Within the next ten years there will be a substantial increase in the yield of the State forests. In 25 years the yield will be many times as large as it is now. This will come about because large areas of the State forests, which are now stocked with middle-aged trees, will then be ready for harvesting.

No experience tables are available to show how much the forests of Pennsylvania will produce, but if we base an estimate of yield upon European experiences, as well as upon some experiences in the forests of Pennsylvania and

other States, it seems conservative to expect a net annual return of \$2.50 to \$3.50 an acre from our well-managed State forests. When we have rebuilt our forests, and they are mature enough to produce merchantable wood, we may expect them to produce a regular and substantial revenue in excess of all operating costs.

A net annual revenue of only \$1.00 an acre on the 1,290,000 acres now owned by the Commonwealth would mean a total net annual income of \$1,290,000. Should the average income amount to \$2.50 an acre, then the total annual net income would be \$3,225,000. This is surely not too much to expect from the State forests of Pennsylvania.

It is certain as time passes the income from the State forests will grow to huge proportions. Pennsylvania will doubtless not limit her State forests to the acreage now owned or about to be purchased by the Commonwealth. As the price of wood advances through the years, as it doubtless will, the income from the forests will probably be proportionately larger and larger. Although no definite forecast of the forest income half a century or a century hence can safely be made, one thing is certain: Pennsylvania State forests will produce an annual net revenue running well up into the millions of dollars. All of this revenue will go to educate the youth of the Commonwealth. In truth, Pennsylvania's forests will become one of the foundation stones of an enduring Commonwealth.

STATE FORESTS SAFEGUARD WATER SUPPLIES

More than a quarter of a million people and many industries already depend upon the State forests of Pennsylvania for their water supplies. Fifteen municipalities have more than 50 per cent of their watersheds located within the State forests. Five municipalities—Chambersburg, Shippensburg, South Renovo, Waynesboro, and



WATER RESERVOIR OF CLEARFIELD. SIXTEEN MUNICIPALITIES OF PENNSYLVANIA DEPEND UPON WATERSHEDS THAT LIE CHIEFLY WITHIN THE STATE FORESTS

Mont Alto—have the impounding basins for their water supplies within the State forests. The water reservoir of Clearfield, though just outside the Moshannon State Forest, is fed entirely by water issuing from within the State-owned land.

A stream survey of the Commonwealth is now in progress. The survey shows that in the six counties of Bedford, Fulton, Franklin, Cameron, Monroe, and Pike, in which the survey has been completed, there are 315 miles of pure mountain streams as against 15 miles that are polluted. It is worth noting that not one of the 74 streams which originate within the State forest areas in these counties is contaminated. At the present time 14 per cent of the forest area of the Susquehanna River watershed, 15 per cent of the Juniata River watershed, and 22 per cent of the West Branch of the Susquehanna River watershed are embraced within the State forests. Special efforts are being made by the Department of Forests and Waters to safeguard and increase the water supply originating within the State forests.

For planting on privately-owned watersheds throughout the Commonwealth, large numbers of trees are distributed from the State nurseries. Since 1910, when the forest tree distribution program was started, 122 water companies have planted a total of more than 10,000,000 trees on their watersheds. All of these trees were secured from the State nurseries. Several million additional trees, purchased from private nurseries, were also planted on the watersheds. Pennsylvania's reforestation program is a very helpful factor in conserving the supplies of potable water needed by the people and the industries of the Commonwealth.

OBJECT LESSONS IN PRACTICAL FORESTRY

Scattered throughout the State forests are many interesting lessons in practical forestry. They point the way to better forest practices. From these object lessons the people of Pennsylvania and other States can learn helpful lessons in forest protection, forest tree planting, forest improvement work, and many other forest activities. If one wants to know how to plant



MANY SPECIAL STUDY PLOTS IN THE STATE FORESTS
POINT THE WAY TO GOOD FOREST PRACTICES

forest trees, or what he may expect from them after they are planted, he can learn by visiting the State forests. Here, too, he can learn how to fight forest fires, how to make improvement cuttings, how to build forest roads, how to control insect damage, and many other things it is necessary to know in order to handle forest lands properly.

Special demonstration areas are being developed in each State forest. These areas show what scientific forestry is and what it aims to accomplish. Pennsylvania's program calls for the establishment and development of these show forests, not only on State-owned land, but also on privately-owned areas, in order that there may be well-located demonstration plots in all parts of the State.

These demonstration plots will be established under widely varying forest conditions. They will show the results of different forest operations. At some place within the State it will be possible to see a sample of every operation necessary in forestry work.

The demonstration plots that have already been established have created much favorable comment, not only from people of this State, but also from foresters and people of other States and other lands. Special tours are organized each year to show the work in the State forests. These tours become increasingly interesting. To achieve the high goal set for Pennsylvania forestry, more lessons must be learned in the woods. The foresters in charge of the State forests are ready at all seasons of the year to help teach the lesson of practical forestry. There is much to be learned in the forests of this Commonwealth; for it is generally recognized that Pennsylvania leads the way in State forestry work.

STATE FOREST PROBLEMS ARE MANY

There are many things concerning our forests that are not yet known. Each forester is con-

fronted with a long list of unsolved problems. Forestry is one of the youngest professions, and there are 110 different kinds of trees native to the forests of Pennsylvania. These are found growing under a great variety of conditions throughout the 13,000,000 acres of forest land in this State.

Each of the State forests has its particular serious problems. The forest fire problem is



HEADQUARTERS OF THE PENNSYLVANIA FOREST
RESEARCH INSTITUTE

common to all. Insect damage and diseases are rather general. The matter of forest tree planting presents a wide range of pressing problems. Practically every acre of forest needs some kind of improvement cutting. Growth and yield studies should be made for all types of forest trees. More efficient and economical methods of

utilizing forest products must be developed. These are but a few of the pressing problems that confront the forester today.

In the study of most of these problems some progress has been made. In each major line of forest activity some special studies have been initiated. More than 100 study plots have been established in the State forests, primarily for the collection of growth and yield data. Much helpful information has already been secured in these plots; but there is still much to be learned.

To advance these special studies, the Pennsylvania Forest Research Institute was established at Mont Alto, in Franklin County, as a branch of the Department of Forests and Waters. This is the first institution of its kind to be operated by a State department of forestry in America. The establishment of this institute is one of the most progressive achievements in Pennsylvania forestry.

THE PEOPLE APPROVE OF THE STATE FORESTS

The people of Pennsylvania are heartily in favor of State forests. They want larger and larger State forests. A quarter of a century of State forest administration has proved that the State must take the lead in forestry, and that the Commonwealth alone can foster crops that will not come to harvest before 20, or 50, or even 100 years have passed. The people of Pennsylvania also understand that the greatest asset of any State is the health and welfare of her people, and that carefully managed forests

contribute abundantly to both health and welfare.

It is a fact now generally accepted that the best way to guarantee continuous supplies of wood, to provide public recreation and health centres, to insure good hunting and fishing, and to protect the water supplies, is to maintain large areas of carefully managed State forests in various parts of the Commonwealth.

The excellent results already achieved in the State forests are the best proofs of what forestry can accomplish. The State Forester of Pennsylvania, during several extended periods, has had the privilege of studying carefully the forests of Europe, which have been under intensive management for a full century, and some for several centuries. It is his opinion that there have already been developed in Pennsylvania young forests that compare favorably with those in Europe; and that it will not be long before forestry in Pennsylvania will take its place with the best in the world.

DISTRICT FORESTERS OF PENNSYLVANIA AND THEIR ADDRESSES

District Number*	District Forester	Headquarters
1	J. R. Williams,.	Caledonia State Forest Park, Fayetteville, R. D. 2, Franklin County
2	W. L. Byers,....	McConnellsburg, Fulton County
3	B. D. McPherson	Blain, Perry County
4	F. H. Dutlinger,.	Mt. Union, Huntingdon County
5	T. R. Morton,...	Petersburg, Huntingdon County
6	T. C. Harbeson,.	Milroy, Mifflin County
7	R. B. Winter,...	Mifflinburg, Union County
8	T. O. Bradley...	Mont Alto, Franklin County
9	W. F. Dague,...	Clearfield, Clearfield County
10	C. C. Hogeland,.	118 Sixth Street, Renovo, Clinton County
11	Walter Leach,...	Driftwood, Cameron County
12	H. S. Metzger,...	Heyman Bldg., Williams- port, Lycoming County
13	C. E. Baer,.....	Emporium, Cameron County
14	R. R. Houpt,....	Bell Oil and Gas Building, Warren, Warren County
15	H. E. Elliott,...	Coudersport, Potter County
16	P. H. Mulford,.	Wellsboro, Tioga County
17	E. F. Brouse,...	Montgomery Trust Arcade Bldg., Norristown, Mont- gomery County
18	J. C. Middour,...	6 North Centre Street, Pottsville, Schuylkill County
19	R. W. Stadden,.	618 Main Street, Strouds- burg, Monroe County
20	W. S. Swingler,	Bloomsburg, Columbia County
21	H. M. Nicholas,.	316 Washington Avenue, Scranton, Lackawanna County

22	V. M. Bearer,...	Ligonier, Westmoreland County
23	T. I. Shirey,....	Swank Building, Johns- town, Cambria County
24	C. E. Zerby,.....	Clarion, Clarion County
25	H. B. Rowland,...	Room 348, Capitol Build- ing, Harrisburg, Dauphin County

*For outline of Forest Districts, see map, page 13 of
this bulletin.

FOREST RESEARCH INSTITUTE

WILLIS M. BAKER, *Director*
GEORGE S. PERRY, *Senior Research Forester*
HENRY E. CLEPPER, *Senior Research Forester*
T. EDWARD SHAW, *Senior Research Forester*
JOHN E. AUGHANBAUGH, *Research Forester*
CHESTER A. COOVER, *Assistant Research Forester*

END OF NUMBER